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ISSN—4115 NZ \$8.75 INCL. GST
REGISTERED BY AUSTRALIA POST PUBLICATIONS VBP 3691

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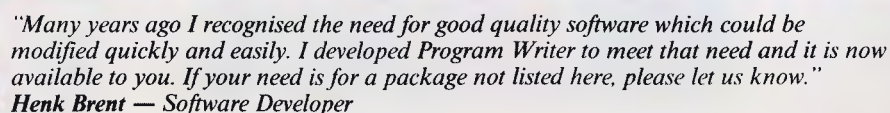
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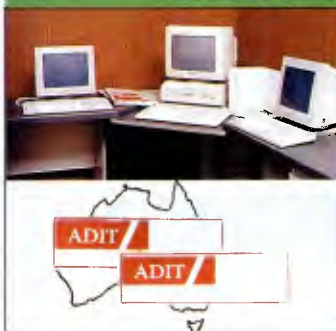
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IBM has redefined its relationship with Microsoft, clearing the way for a Windows revolution. Details of the realignment lead the news this month, followed by the announcement of the first optical processor, Texus Instruments' new printer technology, a new edition of the Intel Binary Compatibility Specification and Toshiba's latest additions to its product range, including the world's first thin film transistor colour laptop.

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- Ventura Publisher, Macintosh Edition A direct port of the popular PC version.
- QuarkXPress 3.0 Pushing page-layout power.
- ImagePrep 3.0 Capturing Windows 3.0 graphics.
- NewWave 3.0 Object-oriented metaphor a reality.

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Readers' chance to have their say.

Managing Editor: Sean Howard; **Assistant Editor:** Cathie Kennedy; **Consultant Editors:** Steve Withers and Ian Davies; **Editorial Assistant:** Sidonie Bouchet; **Proofreader:** Sharon Weinman; **Graphic Artist:** Denise Dillon; **Advertising:** Gerard Kohne, Iain Aitken (02) 369 7232; Vic, SA, WA and Tas Sales Manager: Julie Dominguez, Marketplace: Kerrie Gottlieb (03) 531 8411 Advertising Co-ordinator: Helen Brown. **Production:** Graphic Heart Pty Ltd. **Reader Enquiries:** Sidonie Bouchet (03) 531 8411. **Subscription Enquiries:** Debbie Middleton (02) 369 7206; **Standard subscription rates:** Australia \$70.00 per annum, overseas A\$110 (surface) A\$245 (airmail). **Newsstand Sales:** Network Distribution Co. 54 Park Street, Sydney 2000.
Publisher: Computer Publications Pty Ltd (a subsidiary of Consolidated Press Holdings



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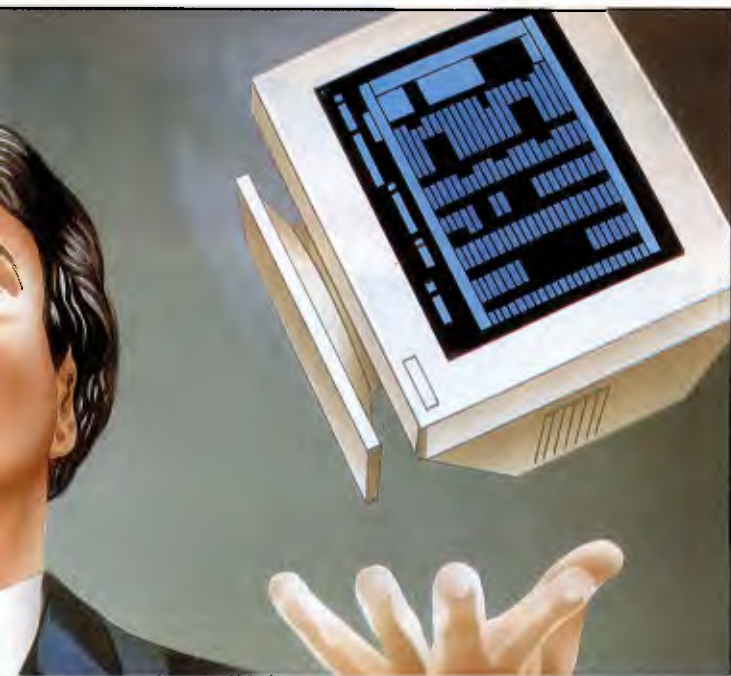
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Two ads steal the limelight . . . guess which.

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FEATURES AND REVIEWS

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After years of speculation, Apple has struck back against low-cost PCs — and against its own reputation — with a range of economical machines. Acknowledging that for some time price has been an obstacle, Apple is planning to shake its image as a manufacturer of expensive computers. Peter McGuire takes a look at the available two of the three newly-released Macs.

81 286 LAPTOPS: COMPUTING ON THE GO

Although laptops have come a long way in the last few years, there's still much room for improvement. Stan Beer evaluates ten 80286 laptops that, while offering enough power for computing on the go, are expensive, heavy and can't live for long away from the mains.

- | | |
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| ■ Amstrad ALT-286 | ■ Atronic Diplomat 286 |
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- | | |
|----------------------------|----------------------------|
| ■ AGI 3000G | ■ Alpha 386SX |
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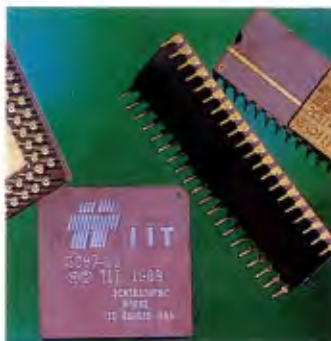
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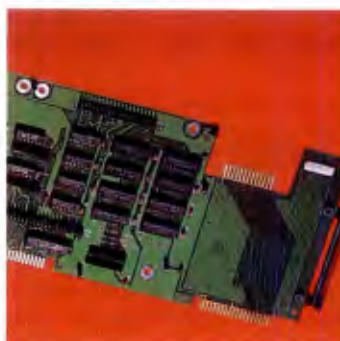
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Insufficient memory to run application;

close one or more applications to increase available memory and try again.

Windows 3.0 may have been a big step forward for some programs. *When Windows 3.0 says there's not enough room to run your DOS programs, it's just trying to tell you it needs QEMM 5.1.*

But it was a big step backward for DOS. Suddenly, it was 1987 all over again. Not enough room for DOS programs to run because TSRs, utilities, drivers and buffers were taking up room your DOS programs need.

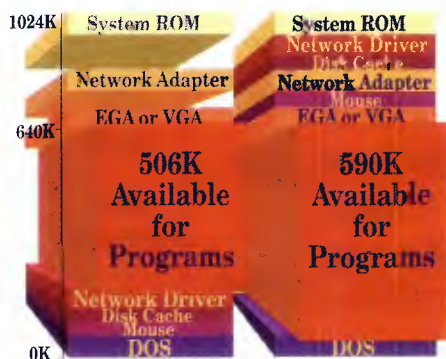
QEMM 5.1 to the rescue

Now, we've updated QEMM to provide additional memory for DOS programs within Windows 3.0.

QEMM 5.1 works with the built-in capabilities of your 80386 or i486 processor to find and recover unused memory segments. As you can see in the chart, there are gaps in your PC's memory usage above 640K. QEMM 5.1 fills those gaps and provides more room for your DOS programs to run.

And of course, QEMM 5.1 still works with DOS when you're not running

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Stories spilling from the newswire this month include Toshiba's 386SX colour laptop; Texas Instruments' new printer technology; claims of the first optical processor; and a new binary compatibility specification.



Microsoft, IBM realignment clears way for Windows revolution

The redefinition of Microsoft's and IBM's relationship, initiated by IBM because of concern over slipping release dates for OS/2 improvements, has freed Microsoft to play its Windows hand to the limit. No longer bound by last year's compromise with IBM to constrain the horsepower of Windows, Microsoft is expected to gradually bolster its DOS-based graphical environment with many of OS/2's high-end features.

Microsoft is also paving the way for a smooth transition for Windows applications to OS/2, hoping to build on its current domination of the Windows applications arena should sales of OS/2 take off. Meanwhile, IBM is steaming full-speed ahead with OS/2 by opening the proprietary aspects of its OS/2 Extended Edition to third-party hardware vendors in an effort to boost acceptance of the high-end operating system.

IBM may have let the cat out of the bag, however, in rationalising its relationship with Microsoft. While IBM now has greater control over timing of OS/2 development, Windows' runaway success will undoubtedly encroach into OS/2's territory as the new graphical environment adds high-end capabilities.

Microsoft, on the other hand, is able to have a bet each way. It profits by the

success of Windows and hopes to ride on the back of this success if OS/2 becomes the environment of choice for most users in the future.

Already the glow from Microsoft's heavily-promoted Windows 3.0 is brightening the prospects for supporting applications and is stimulating sluggish hardware sales.

Microsoft officials last month said that the company plans to make Windows a common development environment across DOS and OS/2. The software giant is also evaluating the advanced feature set of OS/2 — which includes pre-emptive multi-tasking and its High Performance File System — and is examining which of these features to build into future versions of DOS and Windows, officials said.

"We're working very hard to make Windows available on OS/2," said Steve Ballmer, senior vice-president of Microsoft. The first step towards this goal, he said, is the Software Migration Kit (SMK) now in beta testing and the Binary Compatibility Layer (BCL) slated for inclusion in OS/2 2.X, both of which allow Windows applications to run under OS/2.

Microsoft is exploring other ways of providing an even smoother transition between the two environments, Ballmer said. One possible avenue is to build

the Windows application programming interface (API) as a sub-system in the portable version of OS/2, called OS/2 3.X. However, several developers cautioned that those who rely on Windows as a platform for building complex applications may encounter problems in an architecture designed initially around the limitations of DOS and low-end PCs.

"Programming in Windows is a black art," said one Windows developer. "You never know which APIs will conflict with others."

While Microsoft is working to extend the scope of its Windows environment, IBM is gearing up to fulfil its year-old promise of unbundling the proprietary database and communications portions of OS/2 Extended Edition, making them readily available to third-party hardware vendors. In the first half of 1991, IBM will offer versions of Database Manager and Communications Manager that will run under versions of OS/2 1.3 from a variety of hardware vendors, according to sources. IBM has not determined if it will resell the products under its own name or allow Microsoft to remarket them to hardware OEMs as it currently does with OS/2.

It is in IBM's best interest to make Extended Edition components available on the widest possible range of

desktops, according to analysts. "Extended Edition allows [IBM] to control the link between the database component on the desktop and the database component elsewhere in the system. That drives demand for larger systems sales, which is where IBM makes its real money," said David Cearley, a Gartner Group program director.

IBM's retreat to the high ground, however, clears the way for Microsoft's domination of the desktop. Already Windows 3.0 has rapidly cut into the sales of the OS/2 operating system. After the release of Windows 3.0, Dataquest sliced its 1990 OS/2 sales forecast from 500,000 to 300,000 copies.

Windows 3.0 took off with a bang soon after its well-publicised May 22 release by Microsoft. By mid-August, the company reported that it had reached the one million mark in the number of Windows 3.0 copies it had shipped. That figure did not include the thousands of copies sold through OEMs, according to Microsoft company officials.

Although it's hard to determine how many of the copies of Windows 3.0 sit on resellers' shelves and how many are in users' hands, industry analysts are optimistic about the product's movement in the market and its effect on other PC products.

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out there for five years, and now people are asking what is the next step? Windows is just a first step to spur people on to SX and 386 machines," said one analyst.

IDC estimates that Microsoft will sell 4.5 million copies of the program in a year. Sources close to Microsoft have said the company expects to sell five million copies of Windows in 12 months.

The Windows explosion may be a boon to Microsoft's application business and bad news to its competitors, analysts said. When it comes to Windows 3.0, Microsoft has the edge on its rivals in the application business by offering the broadest line-up of supporting products: Excel, Word, Project and PowerPoint.

Strong sales of Windows applications should set Microsoft's application division apart from independent applications developers, analysts said. Arch-rival Lotus must make its 1-2-3 spreadsheet completely compatible with the latest version of Windows 3.0 to compete, according to analysts.

The product has granted resellers a chance to perk up the dullness of a maturing market. Due to its memory demands and use of visual displays, the clamour for Windows will help hardware dealers peddle more memory, 386 systems and VGA displays.

Another wave of Windows buying may come after PC managers complete their evaluations of the product. Analysts also expect new bursts of sales after Microsoft releases its foreign language versions of Windows 3.0.

Although sales of Windows 3.0 are eating into OS/2's prospects, some industry insiders say that in the long run, a Windows 3.0 success will stir interest in OS/2. They say users will compare the graphical user interfaces and choose OS/2.

Chris Bowes



Toshiba maintains technical superiority

Toshiba's launch of a 386SX-based notebook and the world's first thin film transistor (TFT) colour laptop (see related story on the following page) places the company firmly in the vanguard of laptop technology.

The announcement — which also includes a low-end hard and floppy drive equipped notebook and an eight pages per minute laser printer — is a signal to other vendors that any technological break they may achieve will be short lived.

Compaq officials said they were expecting at least a six-month window of technological dominance for the company's recently released 20MHz 386SX-based notebook, the LTE 386s/20. While the new Toshiba notebook is based on the slower 16MHz 386SX chip, it still fits the bill that users have been looking for — the ability to run Windows 3.0 on a readable VGA screen with a high degree of portability.

The T2000SX does that admirably, and at \$8599, it does so \$1475 cheaper than the new Compaq. The Compaq still has its advantages, namely higher performance and the convenience of an optional desktop docking station.

Like the LTE 386s/20, the Toshiba T2000SX features a paper-white sidelit LCD screen with 640 by 480 pixel VGA resolution and 16 grey scales. It also features new Nickel Hydride battery technology, keeping weight to a minimum and battery life to a maximum. At 3.3kg the T2000SX is 0.1kg lighter than its predecessor, the T1200XE, and 0.4kg lighter than Compaq's latest offering. The new battery is claimed by Toshiba officials to provide more than three hours of continuous use.

The unit comes standard with a 20M 2.5in hard disk drive and 1M of RAM, expandable to 9M. Also standard is a 1.44K 3.5in floppy disk drive.

Toshiba's other recently announced notebook computer, the T1000LE, is an extension of the company's T1000SE model. Whereas the T1000SE is a hard disk only system, the \$4299 T1000LE provides both a 20M hard disk and a 1.44M 3.5in floppy drive.

Weighing in at just 2.7kg the T1000LE is based on Intel's 80C86 processor running at 9.54MHz and features a backlit LCD screen with 640 by 400 pixel CGA resolution. The unit comes standard with 1M of RAM, expandable to 9M, and is claimed to offer up to 4.5 hours battery life under normal operating conditions.

The concept of a laptop computer without a floppy drive was difficult to get across to customers, said Toshiba general manager, Kim Hamilton. "The inclusion of both a hard disk and floppy drive will provide users with superior flexibility and functionality," he said.

Chris Bowes

Minimalist architecture promises speed, chips that can mimic others

A new minimalist micro-processor architecture being developed by US-based Teraplex could lead to systems that are not only faster, but can also emulate other processor architectures. Teraplex's Minimum Instruction Set Computer (MISC) design uses, as its name implies, the minimum number of instructions possible to build a basic computer architecture. MISC uses long instruction words to fetch more than one operand at a time, and according to Teraplex officials, it processes data significantly faster than most current desktop computers.

Perhaps an even greater benefit than speed is the MISC chip's ability to imitate other processors by mimicking their instructions with combinations of its own. Because of its high speed, the processor can do this quickly enough to attain very good performance, the designers said. According to Teraplex staffers, they've built systems that can directly execute MS-DOS programs at about four-and-a-half times the speed of a 386-based machine running at 33MHz.

The instructions used in the MISC system are as basic as possible (eg, add, multiply, logic shift, escape and trap). MISC handles instructions that are common on current microprocessors, such as move, by reading a data operand, shifting it by 0 and storing it to the instruction-fetch register. The design also uses a novel approach to floating-point operations: it fetches the numbers, unpacks them into exponent and mantissa, aligns them, passes them through the integer unit, and then realigns and repacks them. Teraplex president Philip McKinney says that this technique on the Teraplex 32-bit CMOS

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design is about as fast as on a MIPS R3000 RISC processor with an FPU.

One advantage to using such basic instructions is that they can be combined easily to form more complex instructions. As a result, the MISC design can emulate other processors. As mentioned above, Teraplex officials say they have checked this with a system running MS-DOS programs and have also tested systems that can run MIPS and SPARC programs. Teraplex is also investigating running Motorola 68000 code.

One of the big advantages of the MISC design is that it doesn't require instruction decoding. Unencoded instruction words directly control the hardware of the chip. The current 32-bit design from Teraplex uses a long instruction word (LIW) technique that fetches 128 bits at a time. The first 64 bits tell the control unit and universal functional unit what to do with the other 64 bits, which are two operands. The benefits of this technique include the elimination of microcode and decoding circuits, as well as the ability to process larger amounts of data more quickly. The current design is capable of operating at about the equivalent of 60 VAX mips, according to McKinney.

The MISC approach minimises the use of clock cycles, which helps to eliminate waiting periods required to make sure that all signals are ready before issuing a clock. The control and functional units that handle processing are designed to filter instructions through without rigidly timing them. McKinney describes this design as a 'big Pachinko machine', after the Japanese arcade machines that filter and bounce hundreds of ball bearings through metal pins.

Teraplex programs its chip using compilers and a language called Teraplex Intermediate Language Interface. This is a high-level assembly-like language for



New laptop colour screen better than a CRT

The quality of Toshiba's latest colour laptop's screen is superior to that of conventional deskbound cathode ray tube (CRT) colour screens, according to Toshiba officials. The T3200SXC is claimed to be the first in the world to feature a thin film transistor (TFT) screen with 256 colours.

Based on a 386SX chip running at 20MHz, the new portable is also designed to compete with desktop computers in storage and expandability terms with a 120M hard disk and three expansion slots.

"This product signals the advent of a new dimension in portable technology," said Toshiba general manager Kim Hamilton. "No longer will laptop users feel they have to compromise on colour or expandability."

Users will have to compromise on value for money, however. While a recommended retail price for the T3200SXC had not been set by Toshiba at press time, it is expected to be in the region of \$15,000 — a significant premium over colour desktop systems.

The quality of the T3200SXC's screen is the result of the latest LCD technology featuring thin film transistors which are formed on the surface of the display to control pixels individually. Colour screens require the transistors to control liquid crystal micro-shutters that open and close to let light pass through green, blue and red filters overlaying portions of each pixel.

Using techniques derived from the production of semiconductors, manufacturers etch transistors onto a thin amorphous silicon film beneath the crystal picture elements. Field effect transistors (FETs) are used to drive the crystals which provide the display.

The T3200SXC's TFT colour screen is claimed to provide resolution quality equivalent to a CRT display. However, the absence of misconvergence and magnetic interferences inherent in a CRT ensures a high colour registration actually surpassing that of a CRT, according to Toshiba officials.

Since the TFT LCD driver supports grey-scale displays, it also provides flicker-free, finely controlled brightness representation while the temperature characteristics of the screen makes it possible to use high brightness, hot cathode fluorescent lamps.

Furthering its stated goal of becoming a major player in the competitive laser printer market, Toshiba has also released a new desktop laser printer. The PageLaser8, a small footprint eight pages per minute unit, retails for \$3995 and prints at 300 dots per inch resolution with both text and graphics. It provides HP LaserJet series IIP compatibility plus four optional emulations — IBM Proprinter XL24e, Epson FX-850, HP 7475A and PostScript.

Chris Bowes

an imaginary serial processor. It is expanded by the TILI compiler into direct machine instructions. Higher-level languages like C are first compiled into TILI for execution.

Teraplex plans to begin prototype production of chips by the end of the year and hopes to have commercial workstations and desktop computers based on the chip in the fourth quarter of 1991. Company officials say they're dealing with several third parties to design computer systems around MISC.

Teraplex is not the only company involved in research in this area. There are a few VLIW SPARC systems in the works, and British computing pioneer Clive Sinclair is rumoured to have developed a similar processor with a 96-bit instruction word, a design that sources say can emulate existing microprocessors.

Some experts have predicted that architectures using long (and very long) instruction words might supersede RISC designs. By combining this technique with a minimal instruction set, Teraplex is attempting to bring about two design revolutions: raising speed limits and developing processors that can imitate other processors. The latter goal of processors that can share binary code could herald true interoperability among computers of different designs.

O Linderholm

New binary specification

Incompatibilities between applications running under various Intel-based versions of Unix should be eliminated by the new edition of the Intel Binary Compatibility Specification. Intel, AT&T and The Santa Cruz Operation say they'll collaborate on a new specification that will enable developers to write but one version of an application instead of one for each Unix variant. Developers working with

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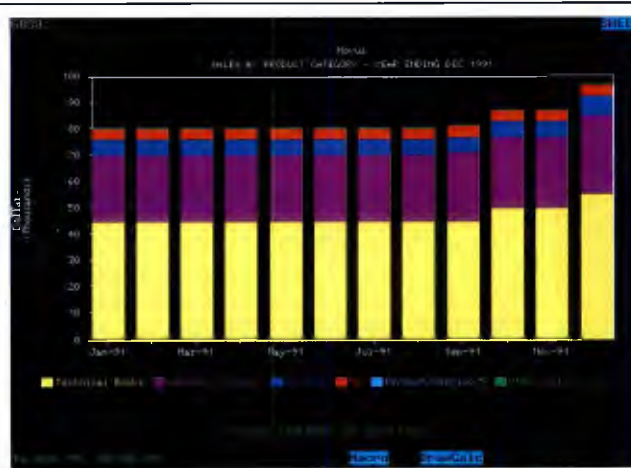
AT&T Unix System V/386 release 3.2 or 4.0, SCO Unix System V/386, SCO Xenix 386 or Open Desktop will be able to have their applications run under any 386 or i486-based operating system that complies with the new binary specification.

Researcher claims first optical processor

A researcher at the Rocky Mountain Research Center in the US says he has developed the first working optical logic device, capable of performing the Boolean operations that are basic to the electronic transistor. According to John Hait, he has designed a hologram (a photographic recording of a pattern of light beams) that can accept two beams of light as an input signal and return a single light beam as an output. This forms the basis for an inverter or amplifier that can perform exclusive-OR and OR operations, among others.

Hait said that a patent search has not turned up any comparable devices. Although some researchers have written off the possibility of performing logic operations entirely with optics, Hait claims that his invention forms the basic building block for designing purely optical computers. Hait's 'optical transistor' performs the logic functions optically, thereby eliminating the need for expensive electronic logic devices such as gallium arsenide substrates, which are nevertheless slower than the equivalent optical device. Hait says his optical transistor could form the basis for optical RAM systems, registers, multiplexers and demultiplexers, and other standard computer components.

According to Hait, his hologram can be manufactured 'synthetically' using software for designing holograms. Hait is looking for a major research lab or company to license his technology and to interface the necessary design software to existing hologram programs. Major improve-



IBM's Ready/2 Run small business package takes innovative bundling approach

In a departure from traditional bundling deals aimed at the small business market, IBM has come up with an innovative package for its PS/2 Model 30 which includes a set of easy-to-use applications covering most small business requirements. The applications are written as templates under the Lotus Symphony integrated software package and cover business and personal budgeting, cashbook transactions, invoices, quotations, letters and labels.

All the software is pre-loaded into the PS/2. Called Ready/2 Run, the entire package comprises the PS/2 Model 30 F31; a choice of colour or monochrome display; a choice of narrow carriage dot matrix printers; DOS 3.3; Lotus Symphony 2.2; the six applications; and an easy-to-use menu system supported by detailed manuals.

The Symphony templates were prepared by Sydney consultancy Pollak Partners, following research into the needs of small business conducted by consultancy firm Price Waterhouse.

While the total value of the bundle as a sum of the recommended retail prices of its components does not exceed similarly-targeted packages from competitor, Amstrad, the system's developers claim it will prove a much better buy for small business. It is claimed that while Amstrad packages regularly include high-end packages such as Microsoft Word and Excel, much of the bundled software ends up as shelfware, because of the effort required to master the individual applications. Amstrad offers half a day of training with its small business packages, but Pollak Partners managing director Ron Pollak says that all a typical user can learn in that time is "how to turn the machine on."

The applications developed by Pollak Partners for Ready/2 Run were also developed with the South East Asian market in mind. In addition to the Australian market, the product will be sold by IBM in the New Zealand, Indonesian, Hong Kong, Singapore and Philippine markets.

Pollak claimed the package includes the only commercially-produced personal budget package available in Australia. He also claimed the combination of the Business Budget and Personal Budget applications, together with built-in Lotus graphs, is unique.

The project not only covered the development of the applications, but included writing full documentation and devising training material used by IBM personnel and resellers. The documentation includes a reference manual and a self-teach booklet.

ments in hologram design software are needed to make his invention a viable product, he concedes.

Optical computing devices have made great progress in storage and connection applications (eg, fibre-optic connections and optical disk drives), but they have proved to be inaccurate when used for computation. Therefore, most research in optics has been devoted to the development of hybrid 'electro-optical' computers, which use optics for storage and data transfer, and employ electronic semiconductors for performing logic operations. Researchers at AT&T's Bell Labs, British Aerospace, Fujitsu and other R&D centres have focused on linking optics to high-speed gallium arsenide logic devices.

N Baran

Tektronix's new colour X Station range

Tektronix, a company that has been actively involved in the development of the X Window System, has released a second generation colour X Station family, designed for applications including CAD/CAM, office automation, process control, computer-aided engineering, mapping, data analysis, transaction processing and computer-aided software engineering.

The TekXpress series consists of three colour members: the \$7220 XP25 desktop X Station, the \$9020 XP27 low-cost, 19in X Station, and the \$10,440 XP29 high-resolution X Station; and one grey-scale member, the \$6090 XP23.

The XP25, XP27 and XP29 feature the TekColor Colour Management System (CMS), a method of colour selection, editing and screen-to-printer colour matching based on Tek's TekHVC (hue, value, chroma) colour model.

All systems feature parallel processing based on Motorola's 68030 and Texas instruments' 34020, 5M of

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All you need is a MIDI Connector Box (optionally available) in order to connect your SOUND BLASTER to MIDI instruments or keyboards.



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8 Bundled software 1: FM INTELLIGENT ORGAN.

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9 Bundled software 2: TALKING PARROT.

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10 Bundled software 3: VOXKIT.

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Tektronix is a manufacturer of electronic products and systems in the areas of design and test and measurement, computer graphics and communications. The company can be contacted on (02) 888 7066.

IBM and Metaphor to build platform for portability

Moving application programs to different operating systems and making them all to work together is one of the biggest challenges facing software developers today. Now IBM and Metaphor say they're going to try to make it easier. The two companies have formed a joint venture, called Patriot Partners to create a new applications software environment that they hope will offer an object-oriented development system for building easily portable programs.

The environment will be independent of current operating systems in that it will ride above the operating-system kernel, but the resultant applications will be able to run on OS/2 and Unix machines, the companies said. An application written for a particular processor architecture will run on that processor, without being modified, regardless of operating system; for other processors, applications will only have to be recompiled, a Metaphor official said. Initial hardware targets are 386-based machines running OS/2 or Unix and IBM's RS/6000 running AIX. Current applications and these new applications are expected to be able to share information through Dynamic Data Exchange. Although the Macintosh isn't currently a target of the project, a



Sanyo notebook offers full 286 functionality

Sanyo's first venture into the competitive laptop market — the 286-based MBC17-NB notebook PC — offers all the comforts of home with a hard disk, floppy drive and VGA screen. Sanyo has been able to at least match the functionality of 286 notebooks from Toshiba, Compaq and Sharp, while offering minor improvements over each competitor's model.

Priced at \$5995, the Sanyo MBC17-NB features a 20M 2.5in hard disk, a 1.44M 3.5in floppy disk drive and a backlit blue panel VGA screen in a 3.2kg package.

Perhaps the most comparable competing machine is Toshiba's T1200XE with its combination of hard and floppy drives and 3.4kg weight. While the T1200XE's CGA-resolution edgelit LCD screen is arguably the best in its class, the new Sanyo laptop offers VGA resolution and is marginally lighter. Compaq's LTE/286 is compromised by its small CGA-resolution backlit LCD screen, but offers an optional 40M hard disk. Sharp's PC-6220 has a VGA screen and, at 2kg, is a full kilogram lighter than the opposition, but lacks a floppy drive.

While many notebook computers can match the MBC17-NB's two hour battery life, the Sanyo model is claimed to be the only one which can be recharged within an hour. The machine's slimline battery packs can be easily removed and charged separately. And unlike most notebook PCs, it can support a full-size VGA monitor with its in-built VGA monitor port.

Based on the low-power Intel 80C286 processor running at 12MHz with zero wait-states, the Sanyo notebook features 1M of RAM and is expandable onboard to 5M.

Acknowledging that at 3.2kg the MBC17-NB is more likely to be carried separately than crammed in a briefcase, Sanyo engineers have included an in-built carry handle in the notebook PC, a feature missing from most of its competitors. The entire package measures 31 by 25 by 5.2cm.

Sanyo's designers have also provided an 'embedded' numeric keyboard, which means that Sanyo's 82-key keyboard supports up to 101 keys through emulation. They have also included a custom slot for an internal modem.

Sanyo marketing manager Bonnie Sundberg claims impressive benchmarks for the 12MHz notebook, largely because of the performance of the machine's 20M hard disk. The disk has a 23ms access time and is connected to an IDE interface controller.

If the Sanyo machine proves successful in the notebook market, users can look forward to a broadening of the Sanyo laptop product range, according to Ms Sundberg.
Chris Bowes

Metaphor spokesperson said that it could be in the future.

The planned graphical user interface for these new applications will be different to existing GUIs but will most likely resemble, and incorporate a superset of, Presentation Manager and Motif. The Patriot programs will operate on the major PC network systems, such as Novell NetWare, and will possibly have distributed object capabilities.

The new venture hopes to release a specification for its environment next year and a toolkit in 1992.

It's an ambitious project, and IBM and Metaphor officials concede that it will take them two or three years to get it all working. Patriot expects to have its software working sometime in 1993.

D Barker

Intel designs an SX for laptop computers

As Chip Chat rumoured two month's ago, Intel has developed a new version of its 386SX processor that's built for laptops and other portable computers. Since then, we've managed to secure further details. The new 386SL Microprocessor SuperSet is essentially a microprocessor with a chip set to back it up. The 386SL includes critical design changes that extend the 386 architecture to add advanced power management features at the processor level.

The SuperSet consists of the 386SL processor and the 82360 I/O chip. The chips operate at 20MHz only, matching the highest speed of the 386SX, which the 386SL closely resembles in performance terms. Intel has added a hardware-level interrupt and a new memory-address space. These are reserved for a new interrupt, called the system management interrupt (SMI). Using a system management handler, hardware companies will be able to access reserved system management memory and I/O addresses.

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peripheral standby, CPU speed control, uninterruptible power supply capabilities and programmed extensions by OEMs to cover almost any other imaginable power management activity. Despite this extra logic that can remove processor time from the operating system, Intel claims that the 386SL outperforms a 386SX.

The 386SL includes a main-memory sub-system controller with a 32M address space, an EMS 4.0 memory controller, an AT bus controller, a full cache controller and support for the 80387SX numeric coprocessor. The companion device, the 82360SL, supports CPU, memory and peripheral functions, as well as providing programmable features to manage power to prolong battery life. Intel provides a set of low-power support logic chips.

The new SL line signifies that Intel is starting to attack the chip set market. Several companies currently sell chip sets that offer many of the power management features of the 386SL in support logic devices designed to be used with the 386SX. However, Intel has something those companies don't — the ability to tie those features into the processor itself. Intel says its approach to power management is inherently safer than that of the chip set manufacturers because the 386SL isn't having to continually fight for control of memory, interrupts, and the CPU with the operating system and applications. The new chip set should lead to laptops with longer battery lives by late next year.

O Linderholm

TI's new printer technology does it with mirrors

Many printer designs, such as those in most laser printers, involve the use of mirrors. But Texas Instruments has developed a new type of printer technology that is taking this approach

to something of an extreme. The company's new technology uses multiple mirrors — hundreds, in fact. What's more amazing is that all these mirrors fit on a single silicon chip.

TI's novel printer technology is based on a new type of chip called a deformable mirror device (DMD). It consists of an array of several hundred microscopic mirrors that can swivel, in see-saw fashion, on a tiny axle. By varying the electrical charge around the mirror, TI can change the orientation of the mirror, moving it to one of three positions: horizontal or tilted slightly to one side or the other.

TI produces the DMD chip in a new three-dimensional chip-manufacturing process. First a base layer is put down, followed by a layer of aluminium that functions as the mirror. This layer is etched in such a way that the aluminium is arranged in tiny squares, with small axles projecting from two opposite corners. Then TI uses a combustion process to remove the material under the main body of the mirrors. The result is that the mirrors are supported only at two corners and can swivel freely. TI officials admit that this manufacturing process is complex, but the company hopes to eventually produce 2-D arrays containing thousands of mirrors. These could be used in a new type of video display.

TI's first application of the technology will be in a printer. The company has created a chip that contains 840 mirrors arranged in a linear array. The DMD chip will be used somewhat like an LCD array in some page printers, selectively letting tiny beams of light hit a xerographic print drum. TI says that a DMD printer will have 10 per cent fewer moving parts than an equivalent laser printer. TI also claims that the DMD chip will be cheaper to manufacture than a large LED or LCD array.



NEC updates range with high-end EISA 486s

NEC's release of two new high-end PCs based on Intel's 486 processor will help to boost the company's prospects in the increasingly saturated systems market. The PowerMate 486/25E is geared towards desktop PC applications, while the floor-standing BusinessMate 486/25E is aimed at network file server or multi-user system host applications, according to company officials.

Both new systems offer considerable expansion capabilities with their five 32-bit EISA slots and two 8 or 16-bit expansion slots. In addition, the BusinessMate offers four high-speed 32-bit memory expansion slots. The PowerMate offers one additional proprietary slot. The memory expansion slots allow the BusinessMate to be upgraded to 64M of RAM and the PowerMate to accommodate up to 32M of memory.

For extra performance, both machines have the option of a second-level cache controller with 128K of high-speed static RAM (SRAM) to complement the 486's built-in cache controller and 8K cache.

The most common operating system installed in BusinessMate systems will be SCO's Unix Release 3.2, according to NEC officials. Running Unix, the BusinessMate will be able to support up to 64 users in a multi-user environment. Alternatively, with Novell NetWare 386 or Microsoft LAN Manager installed under OS/2, the BusinessMate is able to service a network of up to 250 workstations.

Both systems are available with a choice of either 100 or 300M hard disk drives with average access times of 23ms and 18ms respectively. The PowerMate comes standard with a 15MHz ESDI controller, whereas the BusinessMate employs a standard SCSI controller. The BusinessMate will also accommodate up to six 5.25in storage devices with the PowerMate supporting five devices.

The new PowerMate is available in five configurations. A version with 4M of RAM, a 1.2M floppy disk drive, keyboard, monitor and a 100M hard disk will carry a price tag of \$21,782. Another version with 4M of RAM and a 300M hard disk will retail for an additional \$1500, according to officials.

The BusinessMate will be available in two configurations. One of these is fitted with 8M of RAM and a 100M hard disk and is priced at \$26,700, while the other will feature 8M of RAM and a 300M hard disk drive for \$30,300.

Chris Bowes

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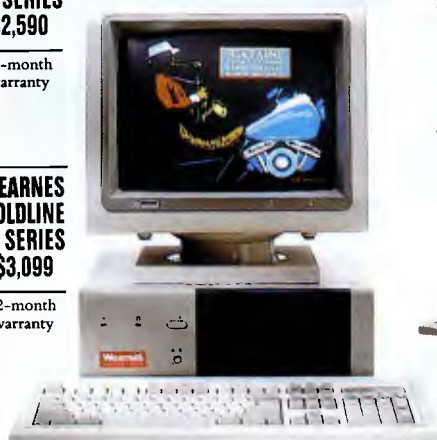


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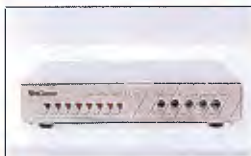
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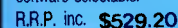
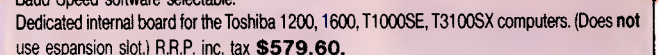
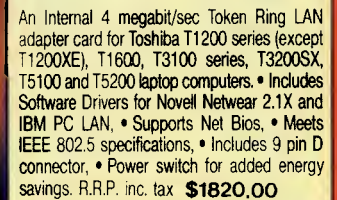
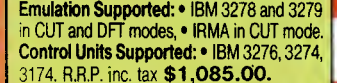
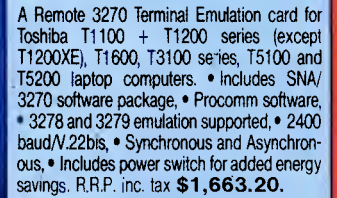
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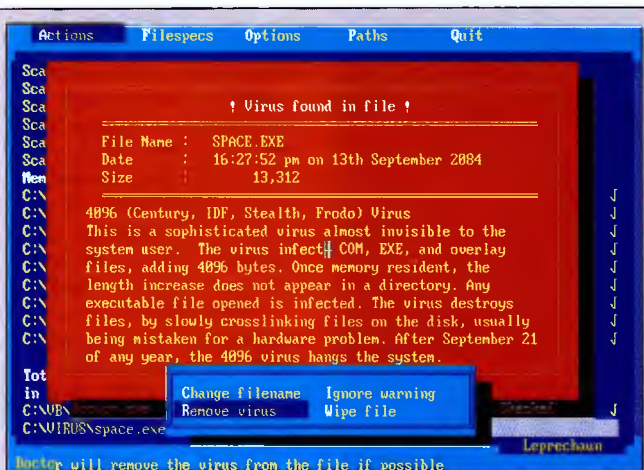
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Windows-compatible Virus Buster to kill viruses not yet a flash in a pervert's brain

Most businesses and large corporations prefer not to talk about viral attacks, as if being caught out somehow reflects badly on the organisation. But these attacks do occur and need to be dealt with. To this end, Queensland-based Leprechaun Software has released a new Windows-compatible version of its Virus Buster software.

According to Leprechaun's technical director Jack Kenyon the latest version of Virus Buster was a little late in coming but he claims the program is better for the wait. The interesting thing about Virus Buster version 3.5 is that it includes the ability to remove a computer virus without needing to know its particular signature in advance. This enables the program to kill new viruses without the need for frequent updates to the package.

Most analysts believe there will never be a definitive virus killing program as virus originators will always be one step ahead. But according to Kenyon, "the ability to kill viruses without signatures means there is a good chance Buster will kill any DOS style virus, including future viruses." He admitted however, the program would not be able to destroy a virus which erased programs as soon as it struck, but claimed that this sort of virus was the least common.

Virus Buster 3.5 incorporates added protection against Stealth viruses which hide themselves from the operating system of a computer, and has detection and removal capabilities for more than 30 new viruses.

Other improvements to the program include an enhanced user interface and full mouse support on the Buster, Doctor, List, Protect and Install components of the package.

The Doctor and Buster modules of the program have been speeded up with an optional Fast Mode. Using intelligent scanning, Fast Mode now gives close to the same accuracy as Standard Mode but is much quicker than before. Actual speed improvements depend on the computer's configuration, disk fragmentation and file sizes, but according to the company Buster is now between five and 10 times faster, and Doctor at least twice as fast.

Leprechaun's approach to virus control is proving popular. The company has almost 7000 customers in Australia and is entering the export market. "We are selling well in New Zealand and have also sold a number of copies in Canada. We have also recently entered the American market," said Kenyon.

Virus Buster 3.5 will cost \$190 for a standard copy, but Leprechaun offers site licensing at prices that will often beat those of shareware.

Thomas Golden

Because it can shorten the amount of time that a mirror is 'on' for each pixel, the DMD chip will enable a printer to generate variable-size pixels, thus producing true grey scales. By contrast, a laser beam must scan across an entire row of pixels and conceivably has less time on each pixel in which to vary its brightness.

TI officials say they're not sure when the first DMD printer will be available.
R Malloy

The mythical elephants' graveyard

You've no doubt by now seen Amstrad's advertisements for its latest series of computers, the Generation 3. If not, turn to page 10 for a look at the press ad. The depiction of the elephants' graveyard has offended the sensibilities of many readers, and quite a few people have levelled complaints against the company for its hard-hitting television commercial.

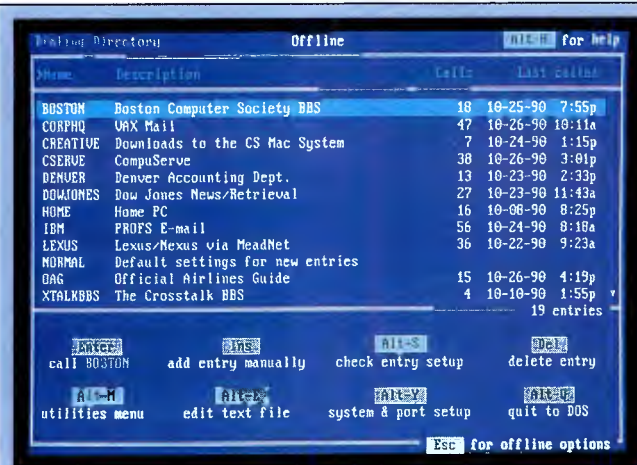
Amstrad agrees its advertising is controversial — in fact, it's meant to be.

Amstrad's sales and marketing director Bordan Tkachuk said, "... I make no apologies for [the press ad] or the sharp-edged TV ad ... I would instead remind [the public] that the real business world is a jungle and is therefore subject to the same predators when it is trying to survive — there are no prizes for coming second."

He went on to say that "in the world of nature, the law of the jungle prevails — it is a case of the survival of the fittest. There is a direct parallel here with the world of business."

Microsoft attempts to clarify Windows confusion

Microsoft last month moved to eliminate confused market perceptions created by competitors over what represents 'true' Windows computing and the migra-



DCA takes on shareware comms packages

Comms software mover and shaker Digital Communications Associates (DCA), co-developer of Microsoft's Comm-Server platform for OS/2, has broadened its focus with a new asynchronous program designed for novice users. DCA is already a major player in the packaged communications software market with its sophisticated Crosstalk Mk4 and Crosstalk XVI communications packages.

With the new Crosstalk Communicator, DCA offers a package inexpensive enough to compete with popular shareware products, while providing a subset of the functionality contained in commercial packages. Quality of support is obviously a key selling point for Communicator, with the good reputation of DCA's local distributor, Sourceware.

Crosstalk Communicator provides the look and feel of Crosstalk Mk4 in a smaller and easier-to-use package. For under \$150, buyers receive a program that lets them access online services, exchange files and send electronic mail via a modem.

This software is aimed squarely at the low-end market, currently dominated by shareware products such as Procomm and Telix, with aggressive pricing and trade-in offers. Communicator stays small and simple by leaving out a few of Crosstalk Mk4's features, such as support for synchronous and network connections. It also does not provide for background operations or multiple simultaneous sessions. This program is otherwise not stripped down. It supports Digital Equipment's VT series, the IBM 3101 and TeleVideo Systems' terminals, as well as ANSI-standard and teletypewriter terminals.

File transfers can be achieved using CompuServe B, Kermit, Xmodem, Ymodem or Zmodem protocols. Crosstalk Communicator can also handle high-speed connections at data terminal equipment rates of 115,200bps, depending on the PC and operating environment.

Call setup in Communicator is simple. The first time a call is made, the login script prompts the user for information such as the phone number, then stores it for subsequent calls. The dialling directory can be arranged according to the user's preference.

Sourceware has not yet determined local pricing and availability of Communicator. US pricing suggests that the product will retail locally for under \$150. It is also not known whether a special offer to US users of competing asynchronous communications programs will be duplicated locally.

Chris Bowes

tion path of Windows to OS/2. According to managing director of the Australian subsidiary Daniel Petre, misinformed industry comment and deliberately confused marketing messages from competitors such as Lotus could create an unnecessary level of uncertainty in the Windows market.

"While there is no doubt graphical computing provides enormous productivity and accuracy improvements, it must be stressed that these benefits can only be enjoyed if the applications being used are specifically designed for the Windows environment," commented Petre.

He further drew on the Lotus example, saying "the recently released Lotus 1-2-3 Release 3.1, while 'Windows compliant', is simply a minor upgrade to Release 3.0 that allows it to run under Windows in protected mode, but without the real benefit of Windows."

And what was Lotus's reaction? Well it turned the tables and blamed Microsoft for confusing the marketplace over the OS/2 and Windows debate.

Lotus Development Australia's managing director Gerry Anthony said, "Microsoft is sending mixed signals. By confusing the marketplace [it] may be retarding the development of end users."

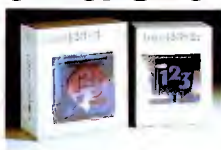
Petre said the second area of market confusion surrounded the migration path to OS/2 for users requiring increased power in the future.

"Some analysts claim Windows is simply a stop-gap measure designed to fill a void prior to mass market acceptance of OS/2; others claim it's an admission that OS/2 will never be an accepted standard," said Petre.

He denied both hypotheses, saying that "it is an attempt to provide all users, no matter what their choice of operating environment, with the outstanding benefits of the graphical interface."

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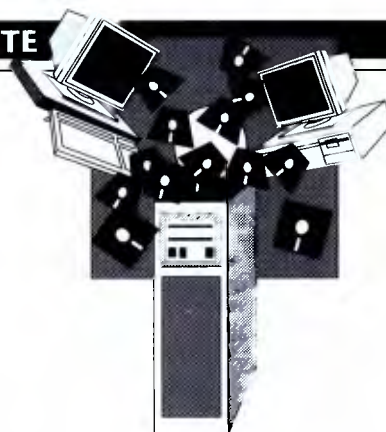
Info Pro, Tel (07)264360. Micro Plus Technology, Tel (07)275 174.

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New releases in this month's upgrade report include the latest on modems, graphics, OOPS and spreadsheets.

New leaves on the tree

With **XTreeNet version 2.0's** peer-to-peer communications network, administrators have unlimited power to view and manipulate files in any directory on the network. Version 2.0 allows users to implement string searches, launch applications, attach and detach commands, bring up an S-List of servers, compress and archive directories, PRUNE and GRAFT entire directories and manipulate print jobs. Other features include an easier installation procedure and the ability to access multiple servers — although users must purchase a separate licence for each server.

Distributor: Computer Equipment News, (02) 957 6686
Price: ELS version, \$595; upgrade for ELS, \$295; The Advanced/SFT/386 version, \$795; upgrade for Advanced/SFT/386, \$395

Sketching made easy

A new version of Autodesk's low-cost, easy-to-use, precision drawing software package has been released. **AutoSketch 3.0** combines the power and precision of CAD with the simplicity of draw features. The enhanced intuitive user interface includes icons, pull-down menus, zoom, scroll-bars and slider bars. Other features included are a text editor, enhanced drawing tools, macro files and compatibility with DXF files.



A 2-D castle highlighting AutoSketch 3.0's hatching and drawing capabilities

Distributors: Sourceware, (02) 427 7999
 Reckon Software, (02) 550 2666
Price: \$299; upgrade, \$75

Not just another agenda

Eighteen months of research and development with Agenda 1.0 enabled Lotus to develop a new version that greatly reduces the learning time required to use the product. **Agenda 2.0** features four Starter Applications to help new users become productive quickly; enhanced date and time features; basic column maths to equip managers to perform expense tracking and project budgets; printing support improvements; and a greatly enhanced macro facility including support for customised menus, definable keys, screen control and error handling, and protection from inadvertent altering of applications.



Agenda 2.0's easily accessible pop-up menu makes setting a date a cinch

Distributor: Lotus Development, (02) 287 1900
Price: \$675; upgrade, \$250

Defining the grey bits

The expanded Filter Set in the upgraded **Gray F/X** gives users greater control over visual effects like sharpen, edge, sculpt, emboss, blur, posterise, despeckle and line segment. Version 1.1 allows users to save workspace information as a template that can later serve as a stylesheet. Other features include enhanced masking capabilities; improved cursors; icons and brush display; user ability to set up functions for a scanner; monitor and printer field upgrades; an improved scan-menu interface; and several specialised features that allow the user to outline, highlight, fill, distort, cut and paste, rotate and add text.

Distributor: Image Products, (02) 415 0344
Price: \$995; upgrade, \$150

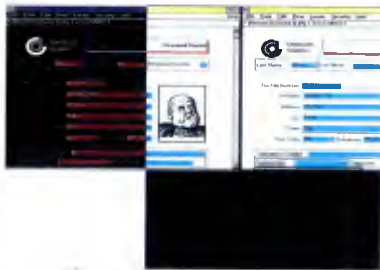
Object-oriented programming

ParcPlace Systems's object-oriented programming system has been upgraded to include integration with standard windowing systems, state-of-the-art capabilities for developing true colour, the Smalltalk Portable Imaging Model for graphics facilities on Macintosh, PC and Unix workstations, incremental garbage collection and support for international applications. The new features of **Objectworks\Smalltalk, Release 4** make it possible to create and port powerful applications more productively.

Distributor: Forefront, (03) 785 1122
Price: \$5300

Fast form filling

Dimension Graphics boasts that its new release of **PerFORM** will streamline the forms-design of small businesses with under 80 employees. PerFORM is a tool for drawing WYSIWYG forms with lines and boxes, into which the user can enter text in whatever fonts and styles the printer can manage. Version 2.1 includes over 100 ready-to-use sample forms and templates, fill-in graphics fields, significantly increased printing speed and simplified file locations. The upgraded version can also save forms in compressed format on disk.



PerFORM is now available for Windows 3.0

Distributor: Dimension Graphics,
(02) 929 5855
Price: \$695; upgrade from 2.0, \$195

Mirror, mirror on the wall

Mirror III, version 2.0, SoftKlone's communications program, has added mouse support, a historical function, online menus and an improved dialling directory. Functions added to the dialling directory include hotkey shortcuts, answer mode, copy, rename, print, edit and erase. To supplement Mirror's status screen and command line interface, the program can now display a single menu containing the most frequently-used commands, and the program remembers commands as you execute them from the command line.

Distributor: PC Extras, (02) 319 2155
Price: \$290; upgrade, \$95; upgrade until the end of Nov, \$85

SDK for OS/2

A **Software Developers Kit (SDK) for OS/2 version 2.0** is designed to allow developers of sophis-

ticated applications or networks to start programming. It features a broad range of sample code to provide a valuable guide on how OS/2 programs should look. It also includes more than 2000 pages of documentation, online reference to quick help, network workstation support and an improved print subsystem for LaserJet and PostScript printers.

Distributor: Microsoft, (02) 452 0100
Price: \$3500

Planning the perfect mouse

Full compatibility with WordPerfect 5.1 and the ability to use a mouse and extended pull-down menus are some of the features in the upgrade of PlanPerfect. **PlanPerfect 5.1** allows users to transfer WordPerfect tables between PlanPerfect and WordPerfect without losing any formulae or other code. The new version includes context-sensitive help, shortcut features, WordPerfect 5.1 printer drivers, a view graph feature and improved text display. PlanPerfect has also the ability to do kerning and word spacing, and supports all DrawPerfect fonts.

Distributor: WordPerfect Pacific, (02) 415 5222
Price: \$715; additional network station packages, \$495

Modeming with PS/2

Dataplex's quad modem, the **DPX-224** is now available in card form for direct installation in the Micro Channel architecture card slot in the IBM PS/2. The first of its kind available in Australia, the OSI-8224PS supports async operations at 2400, 1200, 1275 and 300bps using CCITT V.22bis, V.22, V.23 and V.21 standards. With MNP Level 4 the modem provides error-free communication with any other compatible MNP modem. Other features include auto answer/auto dial and can be configured using Hayes AT commands or the CCITT V.25bis command set.



Dataplex's PS/2-compatible internal modem

Distributor: Dataplex, (03) 735 3333
Price: \$1196

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On IIT Maths Coprocessors:

“Paying under Intel prices and getting twice the throughput looks like a deal to me”

Rick Grehan in Byte September 1989

IIT, the High Performance Coprocessor has complete industry backing. It's the new standard in coprocessor design.



EDITOR'S CHOICE

BEST PRODUCT OF JANUARY

“We plan to support the IIT Coprocessor's 4x4 Multiply Function beginning with MicroStation PC Version 4.0”

Bentley Systems, Developers of MicroStation

“We tested (the IIT Co-processor). . . and saw a 30% speed improvement over the intel chip. . . This looks like the best of both worlds, better performance and lower price”

Larry Long, American Small Business Computers, Inc.

“The performance gain (up to 280% for register maths operations) is attributed to the 3C87's use of double precision internal data path.”

William Rinko-Gay, MIPS, June 1989

“The IIT chips have more features than the Intel versions yet consume only about one-third the power”

Dave Bursky, Electronic Design, June 1989

“Paying under Intel prices and getting twice the throughput looks like a deal to me”

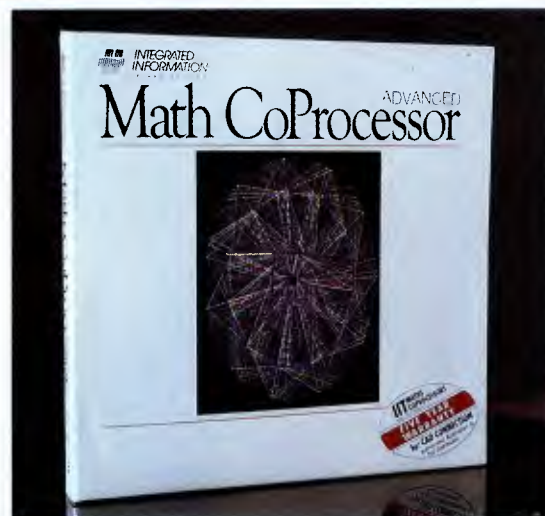
Rick Grehan, Byte, September 1989

“The systems with the IIT-2C87 performed 1.5 to 1.8 times faster than with the 80287”

Marco Cheng, Everex Design

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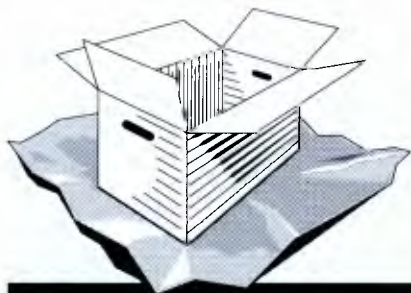
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FIRST LOOKS

386 computing power in Compaq's latest notebook

If you have held off buying a notebook computer because you couldn't see yourself coping without a 386 with at least 2M of memory (with the option of expanding to 10M) and a 60M drive, then now is the time to take a look at the Compaq LTE386s/20.

Weighing in at just 3.4kg, the LTE386s/20 has more computing power than many desktop machines. It is based on a 20MHz 386SX and includes a 4K cache of fast RAM that lets the processor run most of the time without any wait states. It is available with either a 30 or 60M hard disk, both of which have an average access time of 19 milliseconds (ms). The VGA controller is fast; in fact it's sometimes too fast for the edge-lit LCD screen, which results in a lot of 'ghosting'.

The LTE386s/20 is certainly impressive when you con-

sider the performance packed into the diminutive 5.5 by 27.9 by 28.5cm (HWD) casing, and when you take a look at the docking station you can see the machine is a worthy replacement for most deskbound PCs. The LTE386s/20 plugs into the docking station like a very large floppy disk. There is even an eject button on the right-hand side!

The docking station provides two full-length, industry-standard 16-bit expansion slots and two half-height storage bays. It duplicates all the ports on the LTE itself so that you can leave your monitor, large keyboard, printer and modem plugged into the docking unit all the time. The LTE386s/20 is just like a desktop machine when it's plugged into the docking station.

The machine makes use of some innovative technology to fit everything into the



Compaq's LTE 386s/20, measuring 5.5 by 27.9 by 28.5cm has an optional desktop expansion base for full function 386SX desktop capabilities

same LTE casing. It has a new split motherboard design, which means the motherboard is folded into three. The hard disk is a 2.5in model from Conner Peripherals. My guess is that it won't be too long before Compaq is offering an LTE386s/20 with a 120M drive.

The screen on the LTE386s/20 is a lot better than that of its smaller brothers, the LTE and the LTE/286, whose screens were too wide for their height, thereby distorting images. The new LTE has the same aspect ratio as a normal CRT so that graphics look the same. The screen is

also edge-lit, which produces a more even glow than other backlighting techniques.

Compaq's care in matching the components in the LTE386s/20 has paid off. The whole machine, except for the screen, is very responsive. I don't think LCD technology is quite up to this level of performance. Even the Macintosh Portable screen — which is the fastest LCD screen I have seen — was only running with a 16MHz processor.

It looks like Compaq has come up with a winner, producing the most powerful notebook computer on the block.

Jeremy Horey

At a glance

Compaq LTE386s/20

Distributor:	Compaq Australia
Telephone:	(02) 660 0077
Price:	\$10,800 with 30M drive; \$11,500 with 60M drive. Docking station, approx \$1800
In short:	This is the most powerful notebook computer on the market. It has the flexibility when coupled with the expansion base, external monitor and keyboard to replace your desktop PC. However you will pay a premium price for these capabilities.

Microsoft's MS-DOS moves up another notch

It is no secret that Microsoft is preparing a new version of DOS for release early next year. APC took a look at a very stable beta copy of the new operating system to see what MS-DOS 5.0 will offer the many users who haven't yet made the switch to OS/2.

Probably the most important change is the improved memory management. On a 386SX machine with 2M of memory, I was able to load DOS so that I still had 620K of my 640K of DOS memory free to run applications. This is at least 40K more than is available under previous versions of DOS machines. To achieve this, Microsoft has reduced the size of the operating system kernel itself and added a facility to load part of the operating system into high memory.

MS-DOS 5.0 comes with Microsoft's HIMEM.SYS driver which gives the operating system access to memory between the 640K DOS limit and the 1M mark on PCs with more than 640K of memory. To load DOS into high memory you have to use this driver and the command DOS=HIGH in your CONFIG.SYS file.

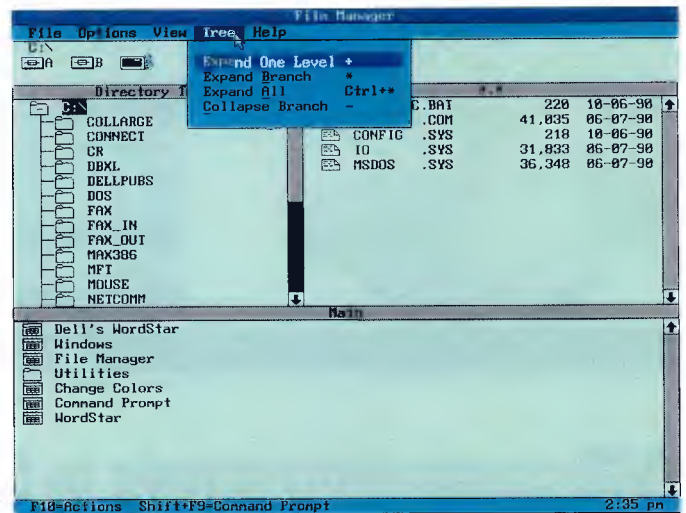
Although COMMAND.COM has grown slightly, if you don't load DOS into high memory, you will still have more space for your applications. According to Quarterdeck's Manifest, DOS 5.0 takes up about 44K

(with FILES=20 and BUFFERS=20), while DOS 4.0 takes up 67K (also with FILES=20 and BUFFERS=20). The main difference seems to be in the kernel size. Manifest reports the kernel as only 7.7K in DOS 5.0 but as 45K in DOS 4.0. With no device drivers and the default number of BUFFER and FILES, DOS 5.0 takes up about 6K less memory than DOS 4.0.

There's also a new version of the MEM command which gives you information on XMS memory and tells you if you have loaded DOS into high memory.

Microsoft has included a re-worked shell program with DOS 5.0. The new version — although it does just about the same things as the shell in DOS 4.0 — is much more like Windows and OS/2 Presentation Manager. For instance, the main menu is now called 'Program Manager' rather than 'Start Programs' as in DOS 4.0.

The menus have the same structure as the Windows 3.0 menus, so the File menu in the DOS 5.0 Program Manager is now identical to the File menu in the Windows 3.0 Program Manager. The File Manager, which replaces the DOS 4.0 File System, is very close to the Windows File Manager. It even has a simple split-screen windowing system that lets you have the main Program Manager menu on-screen at the same time as the File Manager. As in DOS 4.0, the



The File Manager can explode out its directory tree to show you all sub-directories

shell supports a mouse and has graphical user interface features like scroll bars and buttons.

The DOS 5.0 shell looks similar to an early version of Windows, although it does not have the same windowing capabilities. It certainly looks like Microsoft is preparing for the integration of Windows into DOS. The new shell will have a comprehensive, context-sensitive help system, although it was not finished in the version we looked at.

The new shell seems to be faster than the previous version, but I doubt it offers enough to really attract users. Although you can change the colours and the screen mode as in DOS 4.0, you are restricted to four preset colour schemes.

Basic fans will be happy to hear that Microsoft has jettisoned GW-Basic and replaced it with QuickBASIC. QuickBASIC is a much more sophisticated piece of work, and DOS 5.0 even comes with a series of sample Basic programs for beginners.

If there is one thing that signals DOS has finally come of age, it's the new editor. Ever since its inception, MS-DOS has been burdened with a frustrating line editor called Edlin. Even after every mainframe and minicomputer in the world had moved over to full-screen

editors, Microsoft insisted on sticking with Edlin. The new EDIT program is good. It's not fancy, but it is a full-screen editor with pull-down menus, cut-and-paste and search facilities. It has a good online help system and is just the thing for setting up batch files or modifying your CONFIG.SYS and AUTOEXEC.BAT files.

There must still be somebody at Microsoft who likes Edlin — maybe it brings back happy memories for Bill Gates — because Microsoft included Edlin on the DOS 5.0 beta disks. Hopefully it will really go away when the final version is released.

There are various other new features in DOS 5.0. You get Microsoft's SMARTDRV.SYS disk cache, as well as RAMDRIVE.SYS. MOUSE.COM is also included, so you don't have to worry about any software to run a Microsoft-compatible mouse.

There is a command stack editor called DOSKEY which lets you edit and cycle back through your commands using the Up Arrow. The whole program only takes up 4K. Another new command, UNFORMAT, can be used to restore disks that have been accidentally formatted.

Microsoft has enhanced the DIR command. There are three new switches: /o gives you a directory listing

At a glance

DOS 5.0

Distributor: Microsoft
Telephone: (02) 452 0288
Price: Not available at press time
In short: DOS 5.0 offers a lot more than DOS 4.0. Most users will find it worthwhile to upgrade.

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in alphabetical order; /b gives you a listing without any of the file attributes; and /s lists the contents of all sub-directories below the directory in which you issue the command. The command also tells you how much space the

files you have listed take up and if you use the /w switch, DOS 5.0 puts square brackets around the directories.

The beta version comes with a fancy install program. It will only install the new version of the operating system

from the original disks, but you don't need to reformat your hard disk to install DOS 5.0. It also preserves the contents of your AUTOEXEC.BAT and CONFIG.SYS files so that any special device drivers or memory resident programs are loaded as soon as you

boot the new operating system.

Microsoft has included enough new features with version 5.0 — in particular its enhanced memory management — to warrant an upgrade.

Jeremy Horey

Paradox: the SQL with many improvements

Borland's top-of-the line database, Paradox, has never quite managed to budge dBASE out of its Number One position in the database sweepstakes. But that may change with the introduction of Paradox 3.5. Borland has incorporated proprietary technologies that it developed to dramatically speed up the program. Also new is SQL Link, an almost-painless way of using Paradox for accessing data from networked database servers that understand Structured Query Language.

With Paradox 3.5, the basic user interface remains virtually unchanged. Instead of experimenting with radical new ways to interact with the program, Borland has stayed with the comfortable row-and-column basic interface coupled with its check mark-based query-by-example method of ferreting out the data for which you're looking.

Many of Paradox 3.5's improvements are hidden in code. Borland's programmers have incorporated an extended version of the company's VROOMM (Virtual Object-Oriented Memory Manager) into the package. First introduced in Quattro Pro, VROOMM essentially breaks Paradox into code 'objects' that are swapped into, and out of, memory as they're needed. VROOMM also automatically uses available extended or expanded memory. A new feature called TurboDrive is a VROOMM extension that configures Paradox 3.5 for the type of processor that it's being run on. On a 386 machine, it lets

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The basic user interface of Paradox 3.5 is the same; many of the improvements are hidden in the code

Paradox use up to 16M of extended memory.

I tested Paradox 3.5's sorting abilities with a name-and-address database that contained 29,366 records. Running on my 33MHz 386, Paradox 3.0 gave me time for a leisurely lunch, taking 56 minutes, 42 seconds to

sort the database by postcode. But when I loaded Paradox 3.5 and did the same sort on a fresh copy of the database, it was soon apparent that VROOMM was taking advantage of the 7M of extended memory in my system. It took only 12 minutes, 11 seconds to do

the sort — a 77 per cent improvement.

Other improvements in Paradox 3.5 include a number of new commands and functions for PAL (Paradox Application Language), export and import capabilities for Quattro Pro and Reflex files, and custom configuration options that let you fine-tune Paradox 3.5 for nearly any hardware situation.

What really sets Paradox 3.5 apart from the competition is SQL Link. In today's workgroup-oriented environments, more and more data is stored centrally on dedicated database machines that are accessed through a LAN. And learning the intricacies of SQL isn't easy.

Instead of going head to head with the companies selling popular SQL servers, Borland has wisely chosen the option of providing Paradox 3.5 with a 'front end' to SQL. SQL Link, which is included with Paradox 3.5 (but has to be installed separately), lets you use the familiar Paradox interface to work with data on a SQL server. SQL Link automatically translates Paradox commands into SQL and sends them to the server. It then puts data returned from the server into standard Paradox tables. Currently, SQL Link works with IBM OS/2 Extended Edition Database Manager, Microsoft SQL Server and Oracle.

Installing SQL Link was easy — I simply told the installation program that I'd be using it with OS/2 Extended Edition Database Manager. It was then a simple matter to start the main Paradox 3.5

At a glance

Paradox 3.5

Distributor: Borland
Telephone: (02) 418 7330
Price: \$1175; upgrade from Paradox 3.0, \$233
Requires: Core program: IBM PC, AT, PS/2 or compatible with 512K of RAM. SQL Link client: IBM AT, PS/2 or compatible with 1M of RAM and a network adaptor card. SQL Link server: IBM OS/2 Extended Edition 1.2 Database Manager, Microsoft SQL Server 1.0 or higher, or Oracle Server 6.0
In short: With its latest version of Paradox, Borland looks set to edge dBASE from the Number One database position.



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program, choose the SQL options on the Tools menu and tell SQL Link my user name, my password, the name of the server and the name of the database with which I

wanted to work. Once the connection was established, I was able to use Paradox in the normal manner: creating and manipulating tables and running queries.

Like any serious relational database, Paradox requires a commitment to learn to use effectively. But of the serious databases, it remains one of the most in-

tuitive to use. And the new features and performance improvements of Paradox 3.5 place it in a solitary spot.

Stan Miastkowski

Ventura Publisher meets the Macintosh

If you work in a mixed-machine environment in which some people are using Ventura Publisher on their PCs, then the arrival of Ventura Publisher, Macintosh Edition 1.0, is good news.

Ventura Mac is a straightforward port of the version running under Windows, which makes jumping between systems easy; if you've learned one, you've basically learned the other, and that's what platform hopping is all about.

I was able to take a diverse bunch of Ventura files that the APC staff had generated on DOS machines, move them to the Mac (using LapLink), and open them up with their styles and formats intact. This was painless. The fact that you can easily swap Ventura-published documents between PCs and Macs is one of the greatest advantages of this program. Only Aldus PageMaker 3.0 currently provides this capability.

Working in a diverse environment is a Ventura forte. Besides letting you swap between Macs and PCs, this program will pull in text from most word processors

you're likely to run across and graphics from most drawing or painting programs.

Ventura also excels when working with long documents. You can line up a string of text files and the program will run them from page to page, almost automatically, setting up the extra pages as needed. With its cross-referencing and indexing capabilities, Ventura is essentially a book-oriented page composer.

For working on a long but straightforward publication — no fancy layouts, few graphics — Ventura is a good choice. But for documents with a snazzier look, a more complex page structure and quite a few graphics, Ventura is — and here we walk into the shadowy land of subjectivity — hard to work with.

Maybe I've been using PageMaker too long, but I find it far more flexible for page design. Its approach, descended from the cut-and-paste world of the composing room, feels right. Ventura is more geometrical. Like some other popular programs, Ventura uses frames. Every-



Ventura Publisher, Macintosh Edition, automates the production of long, structured documents such as books

thing you do has to be within a frame (a rectangular area). You can expand and shrink these frames, and you can move them around on the page easily enough, but we're still talking rectangles.

While PageMaker is an excellent tool for designing layouts, letting you freely move things around and change widths, lengths and shapes of columns, Ventura is more of a layout fulfillment program. I'd recommend sketching your page design on paper first.

Ventura does beat the pants off PageMaker in a couple of things, however, in particular tabular material. Setting up a table with PageMaker almost hurts. Ventura has a wonderful dialogue box in which you specify how many rows and columns you want; you hit a button and there it is — a nice grid that you can jump around in from cell to cell, using pointer or cursor keys. The program also excels at setting up equations, which can be a typesetter's nightmare.

Another of Ventura Mac's strengths is in styling the text on the page. The program will let you assign a style (eg, type of font or character size) to every paragraph. You can keep these different styles in a catalogue of sorts. This collection of style sheets can also include specifications for the page itself.

Page-layout software, like any other program that combines functionality and aesthetics, is a highly subjective matter. What one person finds excellent is execrable to someone else; what one user finds intuitive is arcane to another. I know totally reasonable people who swear by QuarkXPress (see review in this section), and professional graphics designers who concoct fine-looking materials with Ventura. Although I wouldn't want to switch from PageMaker to Ventura, I can't say it's not right for you. This is a good program that does what it's designed to do. The question is: does it do what you want to do?

D Barker

At a glance

Ventura Publisher, Macintosh Edition 1.0

Distributor:	Xerox, Megavision
Telephone:	(02) 449 0449
Price:	\$1535
Requires:	Mac with 2M of RAM; System 6.0.2, Finder 6.0.2 and a hard disk drive
In short:	VP for the Mac is a straightforward port of the PC version, which specialises in working in a diverse environment. It excels in long documents, but if you require complex page layouts look elsewhere.

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QuarkXPress moves to the top in page layout

With its third incarnation, QuarkXPress has finally left behind its once justified reputation as a powerful but daunting desktop publishing program that made you play by its own rules — or else. In completely rewriting the program, Quark has done more than just incorporate some of the enhancements users have been clamouring for and smoothing some of the more notorious rough spots. Version 3.0 bristles with wonderful new features and the interface has been brilliantly redesigned.

First, here's a look at how some of the major complaints about earlier versions have been addressed. QuarkXPress' default pages were always a poor substitute for real master pages. Now you can have as many as 127 different retroactive master pages per document. You can easily change the master page that applies to a particular page simply by dragging icons inside the new document-layout palette, which gives an iconic view of every page and master page in a document. When you change a master page, all the changes are reflected in every page based on that master. If you apply a new master page, the document pages instantly change to reflect the new master.

The edge of each page is no longer the impenetrable boundary it once was. You can drag objects completely off a page and use the space outside the page as a paste-board much like PageMaker's. You can also drag objects partially off pages to create bleeds, another former near impossibility. You can even create objects that stretch across multi-page spreads.

You're no longer confined to using cumbersome parent/child boxes when you want to associate objects permanently. You can now select and permanently group multiple objects with the standard Shift-click command or by using the marquee tool. Although the parent/child-box arrangement is still available, users can opt to use the more flexible — and less confusing — option of permanently grouping objects as necessary.

QuarkXPress now lets you rotate any object or group (either text or graphic) in increments as fine as .001 degree, either by using the mouse with a new rotation tool or by typing the exact amount of rotation you want.

QuarkXPress 3.0's thoroughly revamped interface makes it a joy to use. The tool palette is no longer attached to the left side of every window, but now floats above the page. There are three new tools for rotat-



QuarkXpress version 3.0 sports a new Measurements palette

ing objects, creating irregularly shaped picture boxes and zooming the page image with a magnifying glass. In a welcome touch, you can drag the magnifying glass over a displayed page to exactly select the area to be shown when the page is zoomed. Double-clicking on most tools lets you customise their defaults.

At the heart of QuarkXPress' new look is the floating measurements palette. It displays information about any selected object, such as x,y co-ordinates, overall measurements, the amount of rotation, the fonts used and so on. These numbers aren't a static display. You can click in any box and type in new information, and the selected object instantly changes accordingly. This is a great way to modify objects quickly, because you can use the palette to simultaneously modify all the objects in a multiple selection.

Quark has made things even quicker with some clever shortcuts. There's a pop-up font menu when text is selected, for example, but you don't have to scroll to find and change fonts. You can simply begin typing the name of the new font into the field next to the menu. As soon as you've typed enough characters to identify a font, the entire font name appears.

You can have as many as seven files open simultaneously, and if you want to move objects from one document to another, you simply select and drag whatever objects you want from each document window. In the

Thumbnails mode, you can drag entire pages between documents.

You can also drag objects into a library palette. Library files are collections of objects — including entire pages or master pages — displayed in reduced view. You can save any object in a library and then retrieve it by simply dragging a copy of it from the library onto a new page.

In addition to managing master pages, the document-layout palette lets you rearrange pages by copying, pasting and deleting them or by dragging their icons. You can easily create multi-page spreads by dragging the page icons into the spread; you can then display and work on the entire spread as if it were one page.

Not only can you make multiple selections and create groups, but there's also a Space/Align command that lets you align or distribute multiple objects. This makes it a snap to create tables from multiple text boxes, for example, while making certain that all the rows and columns align properly.

Although version 3.0 still doesn't have all the features professional typographers might want (such as hanging punctuation or adjustable underscores), QuarkXPress maintains its undisputed lead as the best DTP program for handling type. The program now lets you define the proportions and offsets of superscripts, subscripts, small capitals and superior type.

There are several new paragraph options: you can create anchored rules above or below any paragraph, as

At a glance

QuarkXPress 3.0

Distributor:	Mitsui Computer
Telephone:	(02) 452 0254
Price:	\$1495
Requires:	SE with 2.5M of RAM and 20M hard disk
In short:	Quark has completely rewritten its program for version 3, and the once daunting desktop publishing package now far outpaces its rival, PageMaker 4.0, in most areas.

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well as create automatic drop caps and have some amount of widow and orphan control. You can also anchor any object — text, graphic or group — to text, simply by pasting the object into a text column.

QuarkXPress now supports vertical text alignment within any text box: text can be centred, justified or aligned to the top or bottom within a box. You can also specify the exact amount of space between the top of a text box and the baseline of the first line of text.

As with type, QuarkXPress 3.0's handling of words has been beefed up. The fast spell checker and the powerful global search and replace (it finds and changes text attributes as well as strings of text) can now examine all the text in a document in a single pass. There are also

three new special characters: an 'indent here' character, which lets you quickly indent a paragraph to the character's location; a discretionary-new-line character, which lets a word break at the end of a line without inserting a hyphen; and a non-breaking em dash.

QuarkXPress' handling of style sheets hasn't benefited from 3.0's jazzy interface changes. As in previous versions, the sheets sometimes behave erratically. When you change a style, for example, the text formatting doesn't always automatically change to reflect the new style sheet, which forces you to go to the new style via No Style on the Style Sheet command. This procedure makes you lose any local formatting exceptions you may have applied to the text in a paragraph. Someday the ex-

citement of QuarkXPress' style sheets should come from their power and speed, not their unpredictability.

Although QuarkXPress still can't separate colour TIFF images, there are several handy enhancements to the program's picture handling. You can now create polygonal graphic boxes of any shape by adding and moving points. You can create manual text runarounds for pictures. One clever trick, for example, is to create an inverted runaround that forces the text behind the picture box to flow inside the runaround you've drawn, making it easy to create starbursts and other text effects.

QuarkXPress was the first desktop publishing program to do true process-colour separations. It continues its lead in colour-handling by letting you

specify custom colour chok-ing and spreading information for each colour in a document.

Aside from indexing and creating tables of contents, there is very little that Page-Maker 4.0 can do that QuarkXPress 3.0 can't, and QuarkXPress far outpaces its rival in most other areas. This release also contains excellent documentation that helps you get the most from this rich program.

Like many other high-ticket programs, QuarkXPress 3.0 checks networks for multiple copies of the same serial number. Version 3.0 won't launch if it detects a copy with the same number already active on a network.

QuarkXPress 3.0 is by far the finest Mac desktop publishing program available. It sets a new standard in DTP. *Eric Taub*

Capture and compress Windows graphics

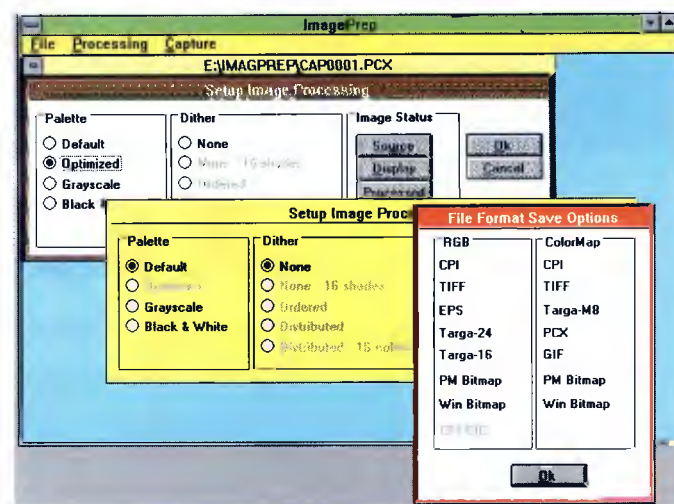
Great news! You no longer have to shell out of Windows in order to access file-conversion utilities for bitmapped images. Computer Presentations' ImagePrep runs under Windows 3.0 and mimics the file translation and screen-capture functions of popular DOS-based programs like The Graphics Link Plus and Hijaak.

ImagePrep's reliance on a graphical environment is not just window dressing. It takes advantage of Win 3's memory management — a boon when working with files that surpass the megabyte mark. And in addition to .PCX, .GIF, TIFF (including colour TIFF), .EPS and Targa files, ImagePrep includes access to what may become the raster equivalent of Windows Metafiles — Microsoft's .BMP format. If you still work with DOS-based programs you'll miss the standard formats it doesn't translate — GEM's

.IMG files, the WordPerfect (.WPG) files and translation to faxable pictures.

ImagePrep's focus on Windows is further emphasised by its screen-capture functions. The normal features are here: redefining the hotkey, choosing a file extension and capturing a full screen. But ImagePrep is smart enough to capture only the active window, a defined area of the screen or the active client window. It doesn't allow you to interactively name the captured file or to capture DOS sessions. Nor does it allow you to specify the bit level of the captured image. The default 8-bit (256-colour) format accounts for the extra step of converting captured images to 16 or 8-bit colour .PCX files.

Though ImagePrep's menus are simply arranged, things can get confusing because the terms used on the menus don't always refer explicitly to the processes they



Though VGA hardware limits ImagePrep's display to eight colours, the actual image processing is robust

will invoke. It's easy to choose between colour, grey scale and monochrome palette options, but unless you peruse the manual you won't understand how Ordered versus Distributed dithering will affect your image. The first option employs the Bayer dither to reduce a full-colour image to an 8-colour file, while the second produces 256 colours with the Floyd/Steinberg algorithm.

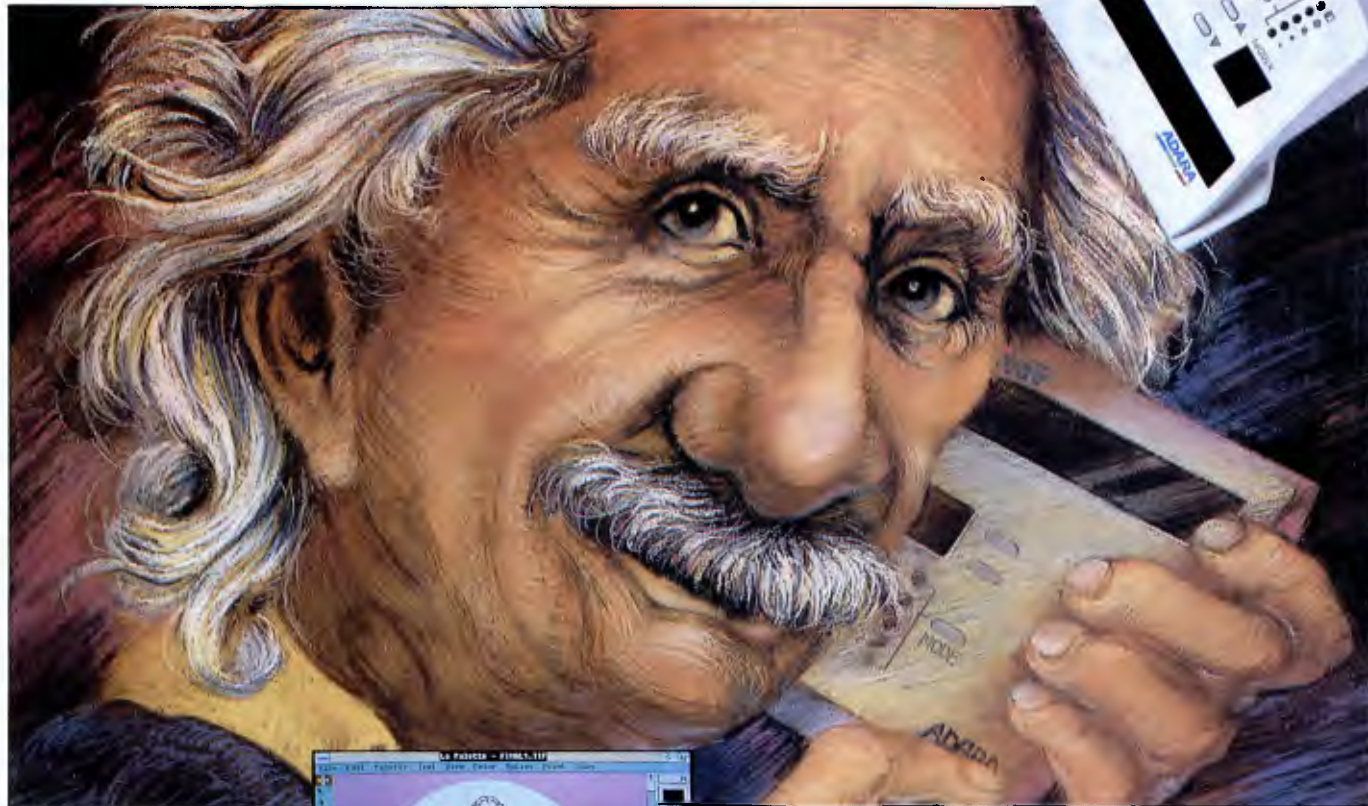
The dither method, the as-

signed palette and the target file format all jointly determine how the image will be processed. You can even see specifications such as bit level, pixel count and file size for the Source image, the Display image and, heaven be praised, for the Processed image by clicking on various status buttons.

While ImagePrep displays on VGA and even EGA screens, the actual translation process is independent of the screen image — and

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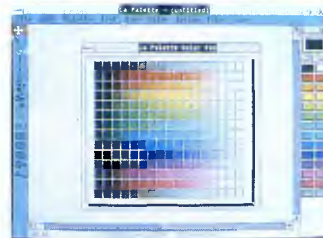
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At a glance

ImagePrep 3.0

Distributor: Business World
Telephone: (03) 764 2222
Price: \$350 (approx)
Requires: IBM 286 or 386 compatible computer, 640K of RAM, Windows 3.0
In short: ImagePrep makes use of Win 3's memory management and mimics the file translation and screen-capture functions of popular DOS-based programs like The Graphics Link Plus and Hijaak, making it an important new graphics utility.

for good reason. Unless your graphics adaptor is extended VGA or better, the screen image is a mere shadow of

the source image — and cannot be used to judge the quality of the picture file. Though it addresses stand-

ard file formats, ImagePrep uses proprietary technology. The Optimised Palette Reduction (OPR) algorithm produces a unique colour map from the RGB values in a 24-bit file. And when a file sports ImagePrep's proprietary .CPI extension, you can opt to compress it. I used a very conservative compression level of four (on a scale where 1 produces the highest image quality and 20 produces the most compressed file), and found that a half-meg picture could be stored in a 50K file.

Some functions, such as sizing and direct printer output, are notably missing from ImagePrep's toolset.

However, the translation routines that allowed me to reduce a full-colour image to 256 greys, or to export an 8-bit picture as an .EPS file, consistently produced high-quality results. The only problem I encountered during testing centred around ImagePrep's inability to read a compressed Targa file. All other images loaded without a hitch. The program tackles the problems of processing full-colour RGB images and 256-colour images within the limitations of VGA Windows, making it an important new graphics utility.
Luisa Simone

Hewlett-Packard's newest wave for Windows

One of the most interesting — and potentially most important — applications to appear for Microsoft Windows 3.0 is an updated version of Hewlett-Packard's NewWave environment. There are two ways of looking at this program: as a set of reasonably-priced utilities for Windows; or as a glimpse of what most graphical user interfaces (GUIs) will be like in the future.

This latest version of NewWave introduces an Agent capability, which is essentially a powerful keyboard macro facility. To perform a given task, all you need to do is select that task's icon and drop it on the Agent icon.

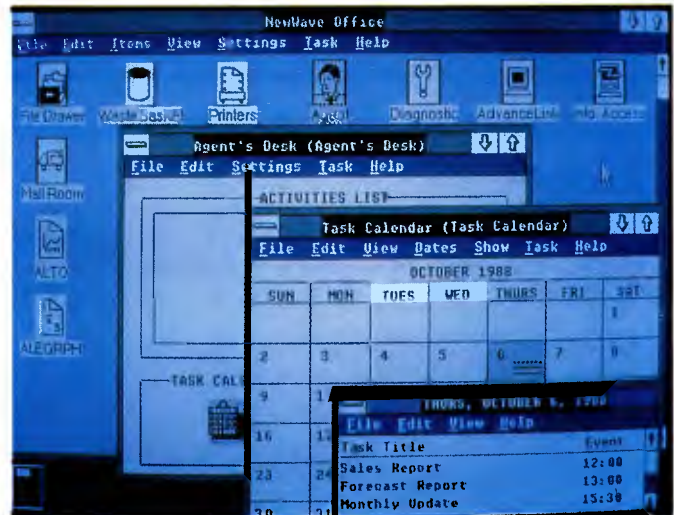
One of the nice things about this macro facility is its ability to do tasks on a

routine basis (eg, every hour, day or week).

Another important feature of this new version is network support, which lets users share NewWave features. But perhaps the most exciting feature of NewWave — and the hardest to describe adequately in a simple features list — is its support of objects.

NewWave has no data files as such. There are only objects, which are data files that have been linked to a NewWave application. One important type of object is a folder, which functions much like a Macintosh folder. It can contain other objects and you organise your desktop, or Office, as NewWave refers to it.

There are also no applications. What look like applica-



The most important feature in NewWave is its support of objects — data files that have been linked to an application

tions are really tools — specialised folders that store, print or delete the objects dropped onto them.

Creating a new data file in NewWave involves an unusual process. For example, in Windows, you start a new spreadsheet data file by first clicking on the Excel icon and opening a new file. In NewWave, you instead select the menu command 'Create a New Object'. A dialogue box asks you what type of object you want to create. You could then select a Lotus 1-2-3 object and give it a

name. An icon for a Lotus object would then be displayed on the NewWave Office workspace. When you click on this application, NewWave will automatically load 1-2-3 and launch you into the data file you selected.

The most important capability of NewWave's object is its ability to incorporate other objects. Unfortunately, only those objects that are linked with a small number of true NewWave applications have this capability. For example, NewWave Write, the NewWave

At a glance

NewWave 3.0

Distributor: Hewlett-Packard
Telephone: (03) 895 2895
Price: \$352
Requires: IBM AT or compatible with a hard disk drive, a mouse and Windows 3.0
In short: NewWave 3.0 is a glimpse of the graphical user interfaces of the future. For the moment, however, it suffers from a lack of applications.

version of the simple Windows Write word processor, can incorporate 1-2-3 objects, but 1-2-3 objects cannot incorporate other objects.

Since NewWave Write has the capability to incorporate other objects, it is actually a fairly impressive word processor. In a NewWave Write document, you can insert tables from 1-2-3, graphics from HP's optional DOS-based graphics programs and simple annotations. And as more object types appear (made possible by new NewWave applications), NewWave Write will continue to acquire new capabilities.

Unfortunately, there's a dark side to NewWave. For one thing, the program is huge. It uses about 7M of disk space and takes quite a long time to install.

NewWave also suffers from a lack of applications. Only a handful of programs

now work well with it. Some sorely needed applications that HP would do well to add are NewWave versions of Windows Paintbrush or Terminal.

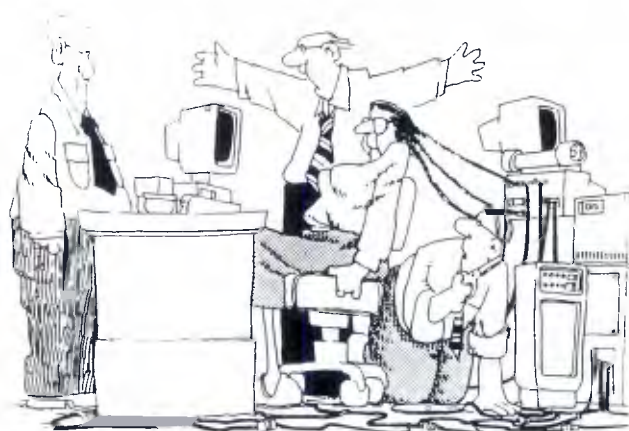
In some cases, the program could be markedly improved by simple additions. For example, you can incorporate 1-2-3 tables into NewWave Write documents, but you cannot change the font in which the tables appear. If you could change the font, NewWave would function as a nice complementary program for 1-2-3.

NewWave is a very interesting program and it's available at an affordable price. It is probably true that someday all GUIs will be like it, but it needs a few more applications before it becomes a required day-to-day business tool.

Rich Malloy

END

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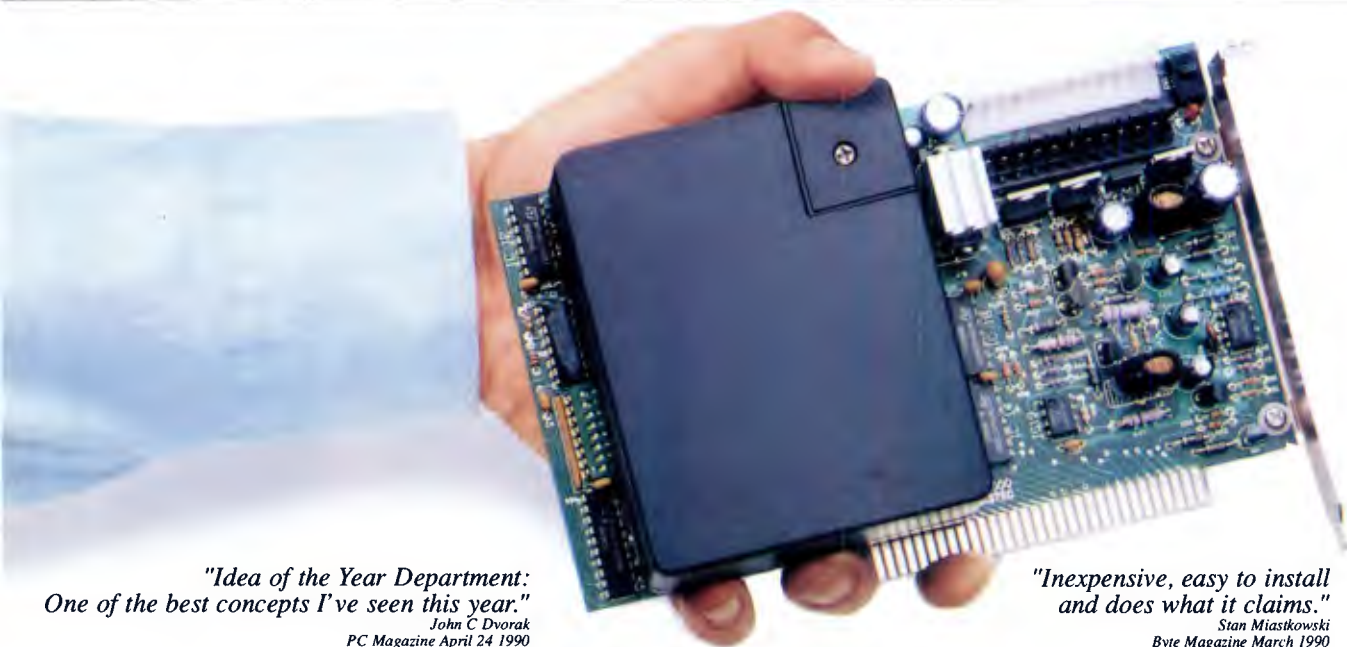
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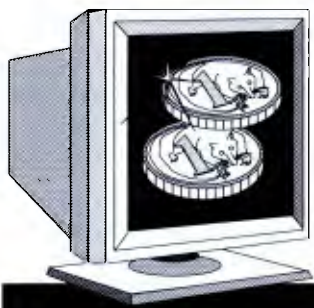
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TWO BITS WORTH

Cost-justifying traditional mainframe and mini-computer systems has long been as much art as science. Cost-justifying personal computers, however, seems to be an even more daunting task. Based on pronouncements made by some analysts, one might be tempted to believe it to be beyond the pale of science, deep in the realm of the blackest of arts.

Consider, for example, the allegation that the billions spent on personal computer hardware and software over the past decade have not added a whit to white-collar productivity. Consider too, the common claim that personal computers sit idle most of the time as wasted resources. Consider further the complete abdication of responsibility by some industry gurus who believe that personal computers need no justification at all; PCs should be taken for granted as necessary like chairs, desks and telephones.

If these claims concerning lack of productivity and valid cost justification are not challenged effectively, the computer industry will be in a sorry state in the years ahead. What's more, all the newer, more capable graphical environments like OS/2, Windows, OSF Motif and Open Look will fall far short of success because all

of them — even Windows — require substantial investments in more powerful personal computers before they are widely accepted and used.

What will be the financial return on money spent for more powerful computers? Most readers will agree that persistent questions are necessary and that these questions require good answers. Especially when chillier winds blow through the economy, those who can't show a clear cost justification for new computers aren't likely to get them.

The first requirement for effective cost justification, therefore, is to admit to its necessity. Gee whiz technology and nifty multimedia demonstrations are no substitute for sensible arguments demonstrating a real return on investment. Exciting the right executive about technology may be enough to get a signature on the purchase order, but a convincing cost justification is far more effective.

The second requirement is that there be a real benefit to the business from the investment. That may seem both obvious and trivial. It is neither. One of the reasons why cost justification so often involves black magic is that in many cases the costs are not justified. Not every opportunity to buy nifty new technology is justifiable.

It is not uncommon for proposed computer acquisitions to be ill-conceived. Others may be motivated more by a desire to get some nifty new toys than by a real business need. We are always justified in our requests for new hardware! Aren't we? Well, perhaps so. But maybe we ought to consider the possibility that we are not, at least not all the time.

True cost justification, however, is down-right impossible if no real business gains exist to offset the costs. That's where the black magic comes into play. Under these circumstances, cost justification becomes an arcane ritual to prove something that isn't really so.

Engaging in such rituals benefits neither the practitioner nor the enterprise. It may give those who want technology for its own sake some new toys, but at the expense of the enterprise's productivity and profitability.

The third requirement for effective cost justification is to show, clearly, the benefits that offset the cost of new hardware and software. This requirement isn't nearly as difficult as it seems, provided that the first two requirements are met.

Much hand wringing over the supposed difficulty in cost-justifying PCs is a result of ignoring the first two requirements. If one ac-



Black magic and wishful thinking won't make your manager approve your next computer purchase. But William Zachmann explains how a clear analysis and presentation of the benefits will.

knowledges that cost justification is necessary and determines that there are real, not imagined, benefits, then it should be possible to present those benefits in a convincing manner.

Having said this, however, it is necessary to acknowledge two further potential obstacles: the need for quantification and computer-averse management. The former is nearly always surmountable. The second more frequently is not.

If those managers who allocate money for equipment are inherently averse to computers, then getting a purchase order approved can be a real challenge, to say the least. That is why I've emphasised so strongly the first two requirements for effective cost justification. For this challenge will not be met by avoiding cost justification or

by trying to justify costs that are not justifiable.

In the early 1980s I first propounded (and slyly attributed to my grandfather) a timeless management principle known as Zachmann's Law: 'In decision making within organisations, the factors that bear upon a decision tend to be weighed in direct proportion to the ease with which they can be quantified or apparently quantified'.

Zachmann's Law has two (unfortunate) corollaries: 'The more important the decision, the less likely the critical factors are to be accurately quantifiable'; and 'the more important the factor, the less likely it is to be accurately quantifiable'.

The quantification issue in cost justification is unavoidable. Costs are easily quantified; however, quan-

tifying benefits is usually more difficult. As a result there is a tendency to weigh the costs more heavily than the benefits.

The most straightforward way to quantify the benefits of investment in technology is to clearly demonstrate direct offsetting savings, such as reductions in personnel or at least in staff growth in affected departments. Another good way is to compare the costs needed to accomplish particular tasks given professional labour rates. It isn't hard to show that a \$70 an-hour professional can do more spreadsheets or write more reports with a computer than without one. There is not, however, some generic panacea that justifies costs in every context, nor will there ever be one. It is necessary to address the

specifics of a given organisation.

True, there will be instances where strict quantification of offsetting benefits will be more difficult, even when real benefits are present.

Reasonable management, however, will often be persuaded to accept a certain element of *soft* benefits. And even computer-averse management will have a hard time ignoring an effective presentation of well-reasoned *hard* quantifiable benefits.

In any case, the real key is not to waste time bemoaning the difficulties of cost justification, trying to avoid it, and looking for some magical reason to buy nifty new stuff. One's energy and creativity are much better spent ensuring that the real benefits are there and then quantifying and presenting them effectively.



As Microsoft readies for the release of DOS version 5.0, Jeremy Horey speculates on the strategic issues for PCs in the coming decade.

With DOS 5 due to be released early in the new year, I can already sense the pundits gearing up for the next stage of the great operating system debate. 'Is it DOS or OS/2? Is it Windows or Presentation Manager? And where will the outsider Unix come? It's neck and neck, folks, as they race down the last furlong. And here's the little fella OS/2 Lite, making his run down the outside. And hasn't he got a turn of speed?'

But before we get involved in all that, I want to canvas what I believe are going to be the most important strategic issues for personal computers in the 1990s.

It is data management that will, in the final analysis, determine what choices system planners make in the next five years. Data management has been the most important issue for any sort of computer for the last 30 years — ask any mainframe programmer. In the PC area we have largely forgotten about data management. Data manipulation and analysis tools — spreadsheets,

database packages and even word processors — are so good that we have ignored the more basic question of how to supply the data to use with these tools.

In the mainframe world, the company's data is the central concern; applications are peripheral issues. In other words, the core of any mainframe system is the data itself and the applications are only ways of manipulating that data.

In the PC world, things are reversed. We have great applications, but we haven't paid much attention to managing our data. While we do have products called database management systems, they only provide a basic data storage mechanism and clever ways to retrieve and manipulate that stored data. These systems place very little emphasis on managing the data; that is, protecting, sharing and adding to it. PC systems have rudimentary ways of ensuring data security, integrity and consistency, and systems that effectively collect and share data are almost non-existent.

In PC systems, most data is only available to the user who originated it. At best, the data is shared among just a few users. However, PC systems have made one important contribution to data management — they have started to widen the definition of what constitutes data. In a PC system, documents, text and images are also part of the user's data.

For the first half of the 90s the crucial issue is how to combine the powerful data analysis tools of the PC with the powerful data management methods developed in the mainframe and mini worlds. We must also be able to integrate the highly-structured data stored in conventional databases with textual information and images. We must make the right data available to every user on the system and collect the right data from each user so that it is available to all.

In the longer term we will have to go even further. Researchers at Xerox's Palo Alto labs have come up with a concept they are calling 'Data Theatre'. The idea is

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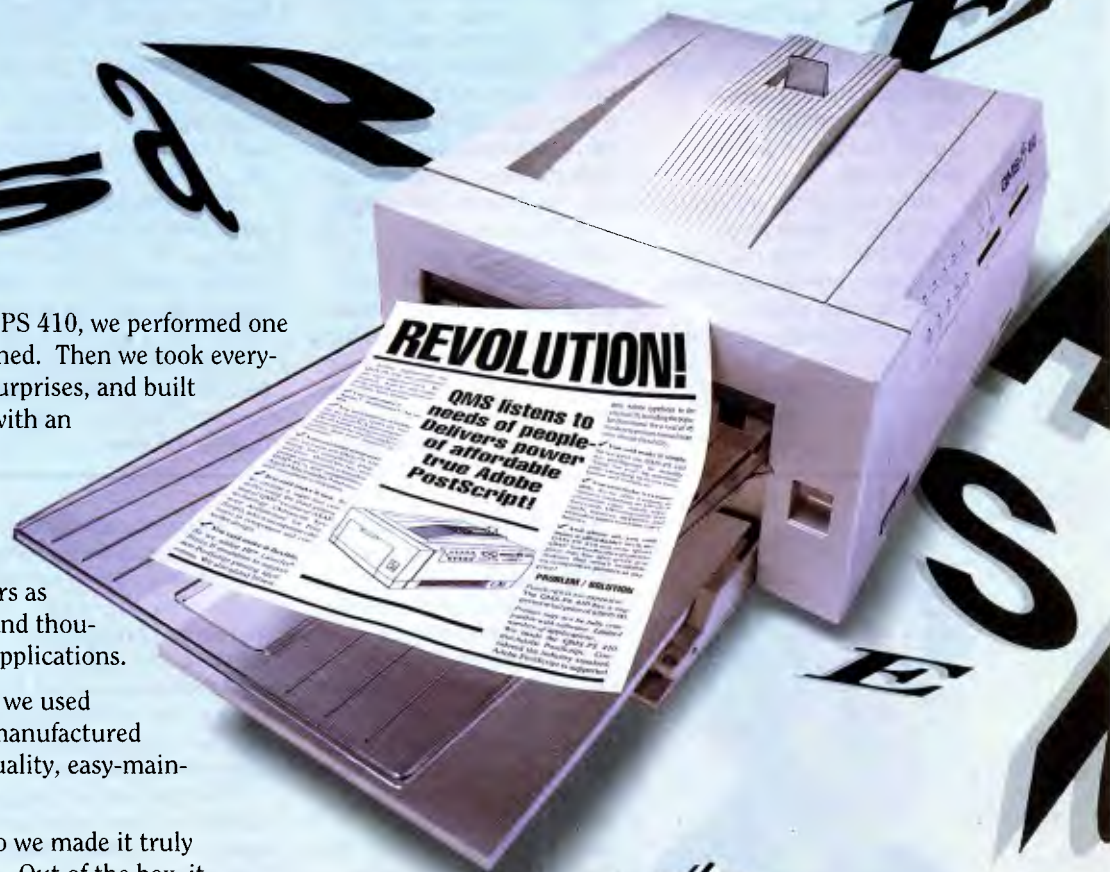
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that users not only need to share data, but also their analysis of that data. If you are looking at stock levels, wouldn't it be useful to see how Bruce down the hall analyses his stock figures? To successfully handle this 'Data Theatre' we need a system that not only keeps track of where data is stored, but also how the data is used.

How are things going to work in this brave new world? Well, some parts of the system are already starting to fall into place. Client/server technology is obviously one of the strategies that these new databases will use.

Companies are building

data access techniques into their PC products: Lotus, for example, has included in 1-2-3 ways for users to create links with external databases; and Microsoft is working on a system that will change how data is stored. This new system will break down the barriers between data stored in conventional database systems and data stored in word processing documents and images.

What does this have to do with operating systems? It shows that corporate users are going to be much more demanding of their operating system in the future. It is old news that servers are going to have to be OS/2 or Unix-based. However, it is not so

obvious as to which operating system should be running on the rest of the computers connected to the network. The DOS 5/Windows 3 combination is probably at best barely adequate. Apart from the limitations in DOS itself, the system doesn't have the heavy-duty interprocess communication capability that will be required by future applications.

Many people have argued that while large corporations will make the move to OS/2 and/or Unix, smaller organisations will stick with DOS. This is not the case. It is the smaller organisations that have to change rapidly to stay in business. They have to be even more com-

petitive than large organisations. They don't have the luxury of one competitive arm of the business proping up an uncompetitive one. And as smaller organisations rely on their data just as much as larger ones, they will have to adopt new technologies to stay afloat.

So while DOS version 5 is an important step forward for DOS, businesses will increasingly turn to OS/2 as the operating system for their PCs.

This doesn't mean that DOS 5 won't be successful — in fact, I expect it to be the highest selling Microsoft product ever.

[For a review of DOS 5, see First Looks — Ed.]



John Dvorak believes that copyrighting code could signify the end of innovation within our industry.

A few hundred protesters surrounded the corporate headquarters of Lotus Development recently to express their disgust with Lotus. The company has taken legal actions to protect its user interface rights. The group protesting calls itself the League for Programming Freedom. Led by famed programmer Richard Stallman, the group says that the precedents created in the Lotus versus Paperback Software case and now the Lotus action against Borland will stifle progress and in the long-term, hurt the industry. They're right.

The league has publicly attacked both the copyright laws and the patent laws as they apply to software. In fact, the concept of copyrighting the look-and-feel of software is a disastrous idea. The programmers want the underlying code protected, but that's all. The best analogy is the one that is what copyrights are all about: books. In books, the user interface is the same. Open the cover, start flipping through pages. All that is protected is the exact wording. Even the stories aren't protected. Can you imagine the paucity of literature if the 'boy meets girl' story could only be written once? Even the titles of books cannot be

protected by copyright. Only the exact words — the code itself — is copyrightable.

To make the book metaphor correspond to software, we find four similarities that should be obvious to the courts: the user interface, the package, the code and the function.

The interface in the book comprises three aspects: the typeface, the book model (hard cover, paperback, folio, etc), and the language presented to the reader (French, English, German, etc). None of this is protected; it would be ludicrous. So why should it suddenly be protected in a different environment?

The package is the size and dimensions, cover jacket, and so on. Obviously this cannot be protected either.

Then there is the code itself. It can be protected by copyright, just like software. Plagiarism is the sin here, not reverse engineering. Remember a few years ago when a slew of movies appeared with the same theme of a child and an adult changing places in life through magic? They all had the same look and feel, didn't they? It's idiotic to think that any one of them should be protected on this basis. That's what we have with Lotus. The scripts were

all different. Just as different as Paperback Software's code was different from Lotus's.

Finally, there is the function. In books, the function can be to amuse, inform, anger and so on. In non-fiction, the books can do a variety of helpful things, just like a spreadsheet program can do a variety of helpful things.

Among all these aspects of the book model only the exact words are copyrighted. And we're not talking about trivial words or phrases such as 'he said'. Lotus wants us to believe that something like 'retrieve file' or the back slash is protected. Nonsense. It's no different from trying to protect 'he said' in a novel.

Even more incredible is the sudden emergence on the scene of a patent to protect computer code. Why can't I patent a cute one-liner in my writing? The patent system was designed to protect small-time inventors from exploitation, not to protect methodology.

It must be accepted that a software program is all methodology. It's a series of instructions given to a piece of silicon to tell it what to do. It's nothing more than a list of instructions.

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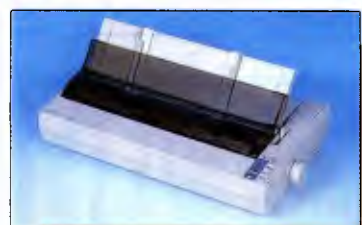
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All the technology is there, but we've still seen no sign of embedded PC networking. Ian Robinson discusses the hesitation of major PC vendors.

After bombarding us incessantly with boasts of technological leadership and design expertise, why is it that no PC manufacturer has yet had the guts to build networking circuitry directly into the motherboard?

More than half of all PCs sold into the corporate and government environment are promptly linked into some type of network, and this proportion is bound to increase over the coming years as networks become even more indispensable. However, these PCs must then be laboriously opened up and fitted with network adaptors before their operators can access the organisation's file server, network peripherals or electronic mail.

Why, in these days when users have become accustomed to megabytes of memory, serial and parallel ports, disk controllers, mouse ports and even VGA-

compatible graphics controllers being built directly into the motherboard, must they be forced to purchase a network adaptor?

The answer certainly has nothing to do with technological complexity, as all the necessary circuitry for network adaptors can nowadays be crammed into one or two ASICs. And with the type of present and future volumes that could be expected to ship, there would be no shortage of semiconductor manufacturers offering competitively-priced chipsets.

Some PC suppliers may argue that the variety of available networking technology makes such a move towards integration a potential risk, if a 'dud' method were selected. This excuse is probably a little closer to the truth, but surely the most dominant networking technologies are obvious enough by now for the design strategists to take a punt?

Why can't IBM, for example, put its money where its mouth is and build Token Ring circuitry into the motherboard of the recently-released PS/2 Model 55 LS diskless workstation? Why didn't Compaq, which is forever touting its technological leadership, add networking circuitry to its current 286N and 386N products?

Besides, users still generally have a choice between colour and monochrome systems, so why not choose between something like a Deskpro 386N/E for Ethernet and a 386N/T for Token Ring? Surely these would cover a large enough chunk of the networking marketplace to become viable sellers?

On another angle, I suspect that the most common residents of expansion slots in high-end laptop PCs are — you guessed it — network adaptors. If you are



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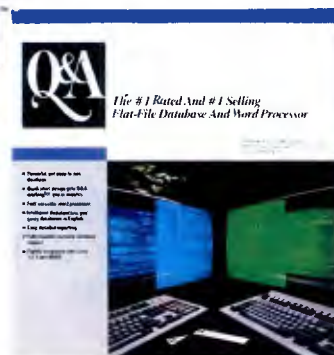
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moving megabytes of data to and from your power-packed portable's 100M hard disk, you don't want to be messing around with floppy-swapping.

Who knows? Perhaps Toshiba will be the first to debut integrated networking in its laptops. After all, when you have serial and parallel ports, VGA graphics, floppy and hard disks, heaps of memory and a network adaptor in your laptop, who needs expansion slots?

Indeed, Toshiba must have recognised this need for laptop connectivity solutions, because it has keenly promoted various laptop networking and terminal emulation products for some time. Furthermore, the popularity of such products as the Xircom external network adaptors also signifies that such a market demand exists.

The benefits of integrated networking technology would not just be limited to a lower overall cost, but would also include greater reliability (due to decreased support problems) and the elimination of hardware contention. Any adjustments in the networking parameters could be made via the PC's standard SETUP utility, for example, rather than by ripping out a board and fiddling with DIP switches.

One final strategic reason why integrated networking should become an increasingly imperative issue for PC manufacturers to address is the growing threat of

workstations. The great benefit offered by traditional Unix-based graphic workstations is the fact that networking has always been built in. As the Sun Microsystems' motto says: 'The network is the computer'.

Workstation manufacturers have been cutting prices and increasing functionality in recent years faster than even their PC-producing counterparts, to the point where they are now hampered only by a shortage of PC-style applications. But they do not have to confront the hurdle of networking — it has all been built in.

Forthcoming 'pizza box' desktop workstations, which will shortly be available for less than \$5000, come with the added advantage of having been designed from the ground up for connected workgroups, rather than individuals.

So the time is right. The technology is there, the market demand is there, but everyone seems to be waiting nervously for somebody else to make the first move. One thing is for certain, however. Once that 'bold' first move is made, the floodgates will open, everyone will jump on the bandwagon, and I would not be surprised to see in-built networking expected as a standard option in all business PCs within five years.

END

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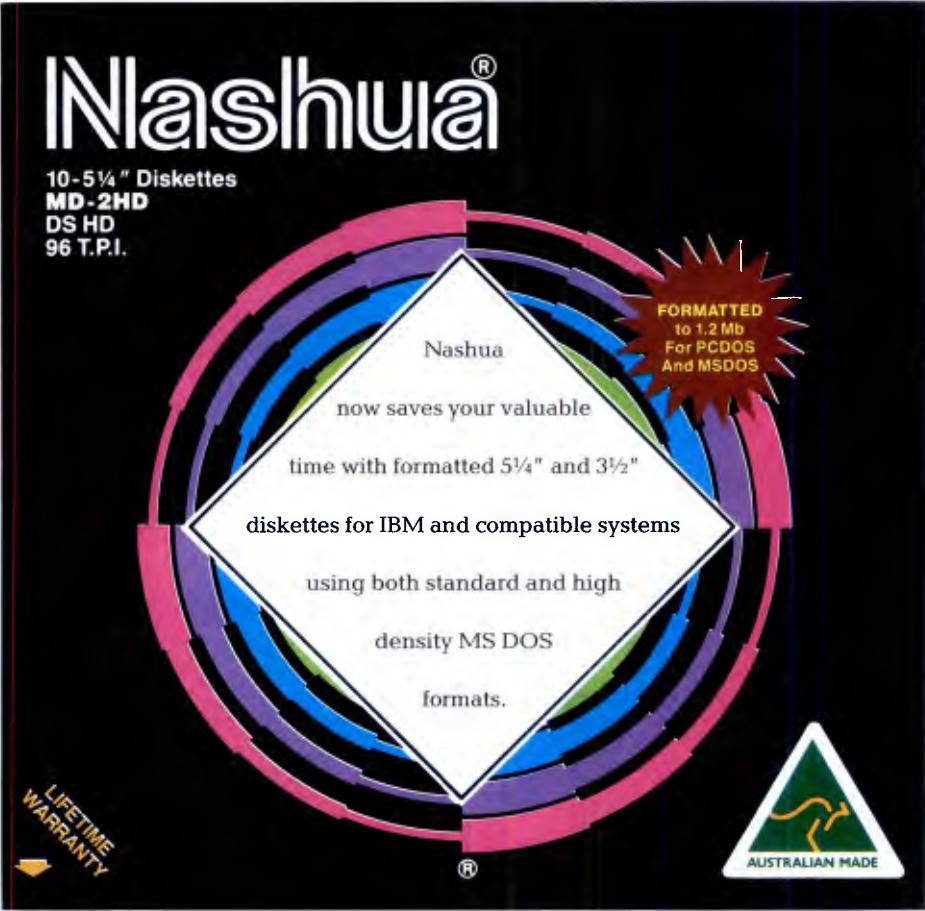
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Drawing the line

I buy APC regularly and eagerly look forward to each new issue; it has become an indispensable way of keeping in touch with new products and developments.

Your October issue, however, leaves me speechless, with undoubtedly the most offensive instance of capriciously sexist advertising I have ever encountered in a computer magazine.

I should be very surprised if your loss of future sales as a result of Read Only Memory's double-page naked girlie spread does not cost you far more than the advertising fees from that company.

And even if that should not turn out to be the case, I still personally object to having computer gear advertised to me in a manner that blatantly insults women. I am confident I am speaking for a great many readers.

Dr L. Andresen
Professional Development
Centre
University of NSW

You might like to note that the advertisement in question has been substantially changed in this issue, and now boasts a double-page spread of product shots. I guarantee the original ad will not appear in future issues of APC — Ed.

Alternative DOS operating systems

I have been a faithful APC reader since 1987, and every past issue since then is filed away for reference purposes. Your publication is second to none in unbiased reviews and articles.

I'd firstly like to raise a small, but irritating point. Lately the print has been smearing, making it difficult to read the copy, and I end up with black hands. Please, if an extra dollar on the cover price would solve the problem then feel free to charge more for your publication.

Apart from this shortcoming, I would like to see a bit more on MS-DOS alternative operating systems. It is difficult to make the leap into the unknown from the familiar.

And finally, the Read Only Memory advertisement in the October issue of APC is tasteless, sexist and should have no place in a publication of APC's professional standard. I realise that you only print the ads, but seriously, what is the connection between semi-naked women and CD-ROM?

C Hofflin

To address your first point, yes, you will find slight smudging of the ink when the magazine is just off the press. It usually takes around two days to dry completely, so you've obviously purchased your copy the day the magazine hit the newsstand.

We will be looking at alternative operating systems in the new year, when we launch an expanded productivity section in APC.

And finally, refer to my comments in the above letter on the Read Only Memory advertisement — Ed.

More than two hours

Are my computing needs so unusual? Why do manufacturers of laptop computers seem to consistently miss the mark?

I need a computer to carry with me every day — that rules out anything over 2kg. It must be adaptable to future needs, so it must run DOS programs, not just built-in applications. And it has to run on batteries. That doesn't mean limping along on Ni-Cads for a couple of hours a day before gasping for a power point, but running for weeks. For years I have tolerated Ni-Cad powered calculators — I need something I don't have to worry about.

Long battery life rules out a large screen, but I can live with that. It also rules out a disk drive, but that's alright too, as I have a PC at home to handle input and output. Anyway, disk drives don't take to being dropped.

What we end up with is a notebook-sized computer with a good keyboard and plenty of RAM to hold my favourite applications and long battery life.

Am I asking too much?

R Crigan

END



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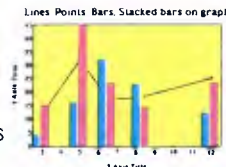
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▶ 5th generation editing and compiling.	No	Yes
▶ Relational Query building.	No	Yes



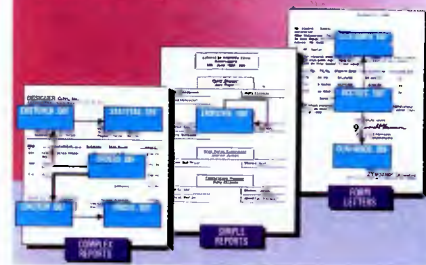
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Low-cost Mac trio

Steve Jobs must be mad as hell. In 1984 his company, Apple, launched the computer that he hoped would be the computer for every man. Six years on, Jobs is working on his NeXT computer and an ex-Pepsi salesman has launched the computer that could well make Job's original dream a reality.

The Macintosh has always been a controversial computer. It has inspired almost religious fervour in its growing army of supporters, but drawn the scorn of many conventional computer users. It sparked a revolution in the user interface, but has watched Microsoft Windows become the most-used graphical user interface. It introduced the world to 32-bit computing, yet it is now overshadowed by the high end of the MS-DOS market. It is the promise that never quite was.

Trouble was, the Macintosh, with all its advanced features, was just too pricey. It became a yuppie computer, in the days when there were yuppies. True, the Apple IIe was cheap enough, but students who grew up with these machines usually had to settle for the relatively primitive — but much more affordable — MS-DOS platform. And once a library of MS-DOS software was built up, changing back to Apple became almost impossible. Until now.

Apple has struck back — against Windows, against low-cost PCs and even against its own reputation — with a trio of new machines that might even give Amstrad a scare.

Killing off the Mac Plus and SE is the Macintosh Classic, priced from \$1695. If it is colour you want, the Macintosh LC, available early next year, will be priced from \$2695. And for users after room to grow, the new Macintosh IIsi reduces the entry price to the modular Mac range to just \$6995. Apple has also announced two new 12in monitors — one colour and one monochrome — and a card for the LC that will let it run Apple IIe software.

System software

The key to Apple's success is its user-friendly operating system.

The new economical Macintoshes, which debuted in a blaze of glory on October 16, are expected to turn the tide for Apple. The trio, comprising the Classic, LC and IIsi, represent a substantial reduction in the cost of purchasing a Mac. Peter McGuire looks at the machines on which Apple's hopes ride.

It comes in two parts, the System and the Finder, currently at Release 6.0 and 6.1 respectively. Three 3.5in disks store the files, an installer, HyperCard 2.0, Font/DA mover, (which installs and removes fonts and desk accessories) MacroMaker, (used to record macros), Disk First Aid (a disk formatter), and a range of network installation utilities.

Most readers will be familiar with the Mac's desktop interface. Pull-down menus with command-key equivalents, a trash can for discarded files, iconic representations of applications, files, directories and disks, all driven by a single-buttoned mouse and mastered in a few hours. It was the first truly successful graphical user interface.

The standard system still comes with seven WYSIWYG font styles — Chicago (12pt), Courier (10, 12pt), Geneva (9 to 24pt), Helvetica (10, 12pt), Monaco (9, 12pt), Symbol (10, 12pt) and Times (10, 12pt). Other fonts are readily found in the public domain, or supplied with applications. The following eight desk accessories (DAs) are also supplied, and are accessible from any application:

Alarm Clock uses the system clock and can sound one alarm a day.

Battery is used by the Mac Portable to check battery level.

Calculator is a simple pop-up calculator.

Key Caps is a laborious means to enter text without a keyboard.

Find File is an easy-to-use file locator.

Scrapbook stores images cut and pasted from other applications.

Chooser is used to select printer or network resources.

Control Panel is used to change system parameters such as keyboard and mouse characteristics, colour display options, sound settings, desktop pattern, system time and date, and RAM cache size.

Macintosh systems can be enhanced with more fonts, more desk accessories and more Ilnits. For Mac enthusiasts, adding these often inexpensive utilities can make the difference between a good system and a great system.



The system software has advanced considerably since 1984, but it is the tightly integrated hardware that has made the package so popular.

The Classic

Remember the original Macintosh? Evolved from the Lisa, it had a 7.8MHz Motorola 68000 CPU, 128K of RAM, a 400K 3.5in floppy drive, built-in mono display, four-channel sound, a 58-key keyboard and a mouse. It came with MacWrite and MacPaint, and was priced at \$3445.

Earlier this year, the entry-level Macintosh was the Mac Plus. Priced at \$2995, it had an 800K floppy drive, an 81-key keyboard, 1M of RAM and a SCSI interface. More bang, less bucks, but still pretty poor value compared to your average PC clone. Apple was also selling the SE, which featured a single 1.44M disk drive that could also read MS-DOS diskettes, an expansion slot, expandable memory, a hard disk option and a cooling fan. A 2M of RAM, 20M model listed at \$6395.

Enter the Classic. For \$1695 — less than half the price of the original Mac — you get most of the features of the Macintosh SE, but with an optional hard disk of 40M, not 20M, and a new style of keyboard.

APC scored the more expensive Classic configuration, the Classic 2/40. Priced at \$2895, about the same as a budget 386SX micro, it has 2M of RAM and an internal 40M hard disk. The only thing Macintosh fans will want to know is where to buy it. For the rest of the world, welcome to the Mac.

The Mac was one of the first truly transportable computers in the business. The Classic weighs around 8kg and is roughly the size of a pack of disposable nappies. The main system unit contains the disk drives, the motherboard and the display, and even has a recess in the top that allows the unit to be picked up. Shove the mouse and keyboard in your briefcase and away you go.

With the Classic, Apple has given the one-piece platinum-coloured casing of



The lightweight, insensitive keyboard bundled with the Classic is not suited to word processing

the SE a modest face lift. The front section is slightly convex and has the non-grilled fascia of the Plus. The power switch is slightly larger and the keyboard has been radically redesigned.

But much is still the same. The disk drive is on the front and all ports are at the rear, beneath the single power socket. Vents along both sides, in the base and under the handle keep the interior cool, and four rubber feet leave space between the computer and your desk. Rather than use words to label ports, Apple uses some obscure icons. The market is truly international and Apple quite rightly figures that a picture is worth a thousand translations — it's just a pity the pictures aren't better. From left to right, the ports are for the keyboard, an external floppy disk, a SCSI device, printer, modem and an external speaker.

The serial ports are 9-pin RS-422 standard. They are one megabit per second (mbps) interrupt-driven devices, so the Mac can handle simultaneous mouse, keyboard, drive and serial port activity quite happily.

The placement of the 5-pin Apple Desktop Bus port on the rear is inherited from the SE. The Mac Plus had the keyboard connector under the floppy disk drive at the front of the machine, and the mouse connected to a port on the rear. The Classic has the keyboard connected at the rear and the mouse connected to an ADB port on either the left or right of the keyboard. An ADB bus port can handle signals from up to three ADB devices,

such as bar code readers or light pens, and there is no need to have a keyboard connected. A mouse could be connected on its own, if no keyboard was needed.

The new keyboard is a minimalist affair. While it has the same complement of keys as the standard keyboard, including a numeric keypad and cursor control keys, it has two sections sculpted at the rear to make way for the ADB cords. It also has two flip-down legs.

Compared with an IBM keyboard, it has no Caps Lock indicator, is lightweight, insensitive and lacks tactile feedback. OK, so keyboarding is reduced with a mouse, but for word processing, a solid keyboard is essential. Fortunately, Apple has two other keyboards — the \$240 standard keyboard and the \$440 extended keyboard, which has 15 programmable function keys and looks much like a PC/AT-style keyboard.

The single-button Apple mouse is now standard across the entire range. It has silicon sliders, a rubber ball and mechanical action. The wedge shape is quite useable and stacks up well against MS-DOS mice.

The Classic's sound output port is a handy bonus for music and entertainment applications. Forget the puny beep of a PC. The Macintosh's four-channel sound is good through the internal speaker; a knockout through an external speaker. The output socket can also be used for headphones, in case noise annoys fellow workers.

Above the I/O ports is a small slot with a stylised chain symbol moulded into the case. A metal security bracket with a hole for a security cable can be fitted in this slot, making theft of the Macintosh more difficult.

A removable plastic cover above the on/off switch exposes a metal plate and a recessed display brightness knob. Apple would rather display brightness were adjusted from the Control Panel — the rear control knob is not something users are meant to know about! Instead of the 1.5 volt battery used on earlier Macs to keep the internal clock up to date, there is an internal lithium battery. This is a useful



Round the back, nothing has changed — those obscure icons also feature on the Classic

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Technical specifications

Macintosh Classic 2/40

Distributor:	Apple Computer Australia
Telephone:	(02) 452 8000
Price of review configuration:	\$2895
Price of base configuration:	\$1695 (1M of RAM, no hard disk)
Processor:	Motorola 68000 running at 7.8MHz
Optional RAM fitted:	2M
Maximum RAM on motherboard:	4M
Hard disk:	40M
Floppies:	One 3.5in 1.44M SuperDrive
Monitor:	Built-in 9in mono, 512 by 350 pixels
Keyboard:	Apple Classic 81-key
Ports:	Two serial, one SCSI, one ADB mouse/keyboard port, sound-out port, disk drive port
Slots:	None
Main unit size:	34 by 24.5 by 26cm (HWD) desktop
Keyboard size:	40.5 by 14.2cm
Operating system:	System 6.07
Bundled software:	Hypercard 2.0, utilities
Accessories:	Mouse

advance, though replacing the battery is a job for a service centre.

Entry-level Macs were never built to be user modified. The unitary design discourages inside access and little expansion is possible. Indeed, unless you are equipped with some specialised tools, looking inside is impossible. If the Mac Classic had a transparent case, you would see the motherboard on the base of the unit, the ports along the rear and the video and power supply boards aligned vertically on the right-hand side. The chip count is about a quarter that of a standard 386SX PC.

The 68000 CPU is analogous to the Intel 80386SX. Internally, both are 32-bit processors, but they send and receive data along 16-bit paths. Lightening the processing load is a separate graphics processor, which uses an enhanced range of ROM-resident QuickDraw routines.

The 512K of ROM also stores the system calls that make up the operating system and device drivers. It means that more RAM can be used for applications. The onboard RAM can be upgraded to 4M at an Apple service centre.

The 1M of the cheaper Classic is enough to run all but the greediest Macintosh applications, such as Full Impact, PageMaker 4.0, Aldus Persuasion and Claris CAD. What it won't allow is concurrent multi-tasking, or the loading of large systems with dozens of fonts and desk accessories. A 1M Classic will also be unable to run the long-awaited version 7.0 of the system software, which

promises true multi-tasking and needs a minimum of 2M of RAM.

A Classic with 2M or more of memory will run MultiFinder, Apple's means to have more than one application resident in memory. With MultiFinder, the user can toggle between as many applications and desktop accessories as the memory will hold. In practice, a 2M Classic will keep the Finder, one mainstream application and a couple of DAs active at once, as well as leave room for a small disk cache. It is not true multi-tasking, but MS-DOS pales in comparison.

Apple claims the Classic is 30 per cent

faster than the SE, largely due to improved display drivers and a faster screen refresh rate. The SE was perfectly acceptable to most users so the Classic's extra oomph will come as a pleasant surprise.

Comparing the Classic's performance with a PC is a bit like comparing apples with pears. Independent US researcher Ingram has compared the Classic with various PCs running Windows, concluding that the Classic is some 30 per cent faster than the new IBM PS/1, but marginally slower than name-brand 386SX PCs.

However, when it comes to a simple matter of getting the job done, the Macintosh interface brings a different sort of power to bear on the problem.

The Classic is simpler to set up than any other computer you will come across. Plug in the mouse, the keyboard and the power cord, insert the System Startup disk, flick the power switch and away you go. The ROMmed code checks system components, brings up the display, loads the Finder and System from disk and brings up the desktop.

Like its more up-market brethren, the Classic can be shut down from the desktop menus, but doing so does not cut power. For that sort of facility, you need one of the bigger Macs. Should the system hang, the programmer's switch on the left of the casing either cuts the power temporarily, resetting the system, or sends a system interrupt.

In use, the Classic's fan, cooling the 75 watt power supply, is generally unobtrusive. The 40M Quantum hard disk is almost silent too, but accessing a floppy disk is noisier, of course. The SuperDrive floppy disk is a real winner. It reads 400K, 800K or high density, 1.4M 3.5in diskettes. Disks are ejected either from the Finder or, in an emergency, by sticking



Apple has produced with the Classic its first entry-level Mac with a mass market price



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Apple versus Amstrad

The day after Apple's announcement, Amstrad was running anti-Apple ads. It obviously feels threatened by the Classic, and with good reason.

The Amstrad Generation 3 386SX costs \$4500. Granted, that includes a veritable library of software, but the 40M Classic is \$2895, enough of a difference to pick up a reasonable suite of Macintosh software.

In its favour, the Amstrad has a VGA colour display and greater expansion potential, thanks to five free slots and room for 16M of RAM. It comes with Windows 3.0 and a mouse, making it as user friendly as an MS-DOS machine is ever likely to be. MS-DOS machines can also use a wide range of inexpensive output devices, whereas Macintoshes need pricier ImageWriter or PostScript printers.

The Classic's interface, mono though it is, is easier to use. The Macintosh also scores better on sound quality and por-

tability and as such, represents a strong alternative to the Amstrad. The choice will probably depend on what environment the computer will be used in, and whether a printer has to be costed into the purchase price.

If you are a complete stranger to computers, and want one for home rather than work, go for the Mac. It will have you up and running with much less fuss than an MS-DOS micro. A Mac would also be an obvious choice if you had access to one at work. If your work is infested by Intel, however, the Amstrad may prove more attractive, as being able to share files is important. The Amstrad is also more suitable for the hacker who prefers making computers work rather than working with computers.

I have to admit, MS-DOS may be popular, but as a complete system, the Macintosh approach leaves it for dead.

an unfolded paper clip into a small hole next to the drive.

More importantly, the SuperDrive can read, write and format 720K and 1.44M MS-DOS diskettes using the Apple File Exchange utility to carry out the file conversion between Macintosh and MS-DOS formats. The translator supplied as standard goes from DCA to MacWrite format; other translators are readily available.

One of the major features of the very first Macintosh was its display. Though only 9in across the diagonal and with no colour capability, its 512 by 342 pixel resolution gave great graphics and the quality of the image was such that you could use the screen for hours without discomfort. That same screen is found on the Classic, with even faster screen updating routines than the SE. The main drawback is that it is the only possible screen. If you want a larger display or a colour screen, this is not the Macintosh for you.

The major shortcoming of the Classic is that an expansion slot is not included, as it was with the SE . . .

The IIsi

. . . which is exactly where the IIsi comes in. It is a cut-down version of the now discontinued Mac II, which was launched in 1987 as the first modular Macintosh.

The Macintosh II was born with a 15.7MHz Motorola 68020 processor at its heart, plus a 68881 numeric coprocessor for good measure. It has 1M of onboard RAM, expandable to 8M, a 256K ROM, an 800K floppy drive, an optional 40M hard disk and six NuBus expansion slots. A recent

Apple price list has a 4M Mac II with 40M hard disk selling for \$11,595.

The IIsi debuts at \$6995 for a 2M of RAM, 40M hard disk version. It has a more powerful 20MHz 68030 CPU, takes up to 17M of RAM, but has no numeric coprocessor and only one expansion slot. For many Mac users after a little more freedom than the all-in-one SE allowed, the IIsi will be very attractive.

Ingram's performance comparisons indicated that the IIsi was over 50 per cent faster than the fastest 20MHz 386 rivals, and only fractionally slower than a Compaq 386/33 running Windows 3.0. There is no doubt this is a hot box.

Apple supplied a souped-up IIsi for review. It came with 5M of RAM, an 80M hard disk and the new 12in RGB colour monitor. It would normally have the standard keyboard fitted, though this was not supplied. The review configuration would set you back \$9920.

The main unit is smaller than that of previous modular Macintoshes. Measuring 31 by 37.2cm on the desk and only 10cm in height, it is about the size of a smallish MS-DOS computer. The size explains the 'si' designation — 'slimline integration'. The front of the plastic, platinum-coloured casing has a slight bulge to it and there is a green power-on LED above the coloured Apple logo.

The floppy drive, with its emergency disk ejection hole, is on the right and all the I/O action is at the rear. Arrayed along the back, from left to right, are sound in and sound out ports, two RS-422 serial ports, a SCSI port, a video port, an external disk drive port and the ADB keyboard

port. The rear also features male and female power sockets, the security bracket slot and a power button that can be locked permanently on with a half twist.

A useful advance is that the keyboard now has an equivalent to Ctrl-Alt-Del. Pressing the Command, Control and Power On buttons together turns the power on and off temporarily. It takes only a second or two to get inside the IIsi casing. Pressing two clips on the top frees the lid, which comes off to expose the interior. A locking screw can be used to secure the lid.

Once inside, a neat, almost cable-free motherboard is exposed. The front half of the casing area is occupied by the 80M Quantum hard disk and the floppy disk, while the motherboard takes up around half the base. Perched over the motherboard is a Sony power supply, and sitting squarely in the middle of the motherboard is a lithium battery, used to power the system clock. A fan is situated at the rear of the casing.

Most of the custom chips are made for Apple by VLSI. The four 1M SIMM memory modules sit next to the 2cm-square CPU. The full 17M of memory is achieved by simply replacing the 1M SIMMs with 4M SIMMs.

The major talking point of the IIsi will be its expansion slot. In the past, the 10M/sec NuBus standard has been used in the II models, but the SE/30 had its own expansion slot, the 030 Direct Slot. With the IIsi, Apple has attempted to keep both sides happy.

Because of the height of the casing, expansion cards will not stand upright. They are instead connected at right angles to a secondary adaptor card that costs \$395 and sits in the motherboard's expansion slot.

There are actually two expansion slots on the motherboard: one for a NuBus adaptor card and another for a Direct Connect adaptor card. Only one can be fitted, but both come with a 68882 floating point numeric coprocessor fitted.

A horizontal panel on the rear of the casing is removed to give access to the outside world. The original Mac II had no onboard video controller, so one expansion slot had to be given over to a video card. With the IIsi, there is an 8-bit video controller built onto the motherboard and 32-bit QuickDraw routines in the system ROM. This allows 256 colours or grey levels to be displayed, more colours if a 16 or 32-bit video board is installed.

From the Control Panel, the video card can be set to display mono, four, 16 or 256 colours. Colour chews up video memory — an extra 32K is needed for four colours, 96K for 16 colours and 192K for 256 colours. Video RAM starts at 256K and can be expanded to 512K.

Technical specifications

Macintosh IIsi

Distributor:	Apple Computer Australia
Telephone:	(02) 452 8000
Price of review configuration:	\$9920
Price of base configuration:	\$6995 (2M of RAM, 40M hard disk, system unit only)
Processor:	Motorola 68030 running at 20MHz
Optional RAM fitted:	5M
Maximum RAM on motherboard:	17M
Hard disk:	80M
Floppies:	One 3.5in 1.44M SuperDrive
Monitor:	12in RGB colour, 640 by 480 pixels
Keyboard:	Apple standard 81-key
Ports:	Two serial, one SCSI, one ADB mouse/keyboard port, sound in/out ports, disk drive port
Slots:	One Apple NuBus/Direct Connect expansion slot
Main unit size:	10 by 31 by 37.2cm (HWD)
Keyboard size:	40.5 by 14.2cm
Operating system:	System 6.07
Bundled software:	HyperCard 2.0, utilities
Accessories:	Mouse, microphone

Compared to the wealth of MS-DOS expansion cards, the Macintosh has a more limited choice. Options include higher performance video controllers, a second video controller to drive a second monitor, network cards, CPU accelerator cards or perhaps an MS-DOS emulator. Suffice to say, the single expansion slot will probably meet the needs of all but the most power-hungry users, who would be buying a Mac IIx anyway.

Sound

Apple has chosen the IIsi as the platform for its next advance in user-friendly computing — sound.

Sound effects can be used in HyperCard stacks attached to objects on the screen, and spoken messages can be added to letters, electronic mail and desktop presentations. Sound input could also be useful for computer-based training. The IIsi is the first personal computer to come with a microphone as standard. It is a disk-shaped plastic affair with a holder that can be either stuck to the computer casing or clipped to a shirt. The microphone plugs into an appropriately labelled input jack on the rear of the computer.

To put sound onto disk, use the sound section of the Control Panel. It shows the microphone as an input device and lists the available sounds. Under the standard alert sounds used by the operating system and application — Clink-Klank, Boing, Monkey and Simple Beep — are two buttons, Add and Remove. Pressing

Add brings up a window with Record, Stop, Pause and Play buttons. Any sound up to 10 seconds duration can be recorded, named and used as a system alert. It is much more fun than changing the desktop pattern! Remove takes sounds off the list.

The IIsi uses 8-bit sound recording, but according to Apple, two different qualities of sound can be recorded — 22KHz or

11KHz — depending on the sampling rate. A second of sound at the higher rate occupies 22K of disk space, twice as much as a sound sampled at 11KHz.

Compressing recordings is another way to save disk space, but this sacrifices sound quality. Sounds can be compressed by a factor of 3:1 or 6:1, reducing a 22K file to 7 or 3.7K. Using the 11KHz sampling rate and a 3:1 compression ratio is fine for voice recording and gives nine minutes of sound per megabyte of disk space.

Recorded sounds can be cut, copied and pasted, using the Clipboard. It will be up to third-party applications to make good use of these capabilities. For sound to be effective, the computer must have more than just a beep capability. The Mac's sound facilities have always been impressive, whether the internal speaker is used, or the sound is channelled through an external amplifier.

Display

Apple's new colour display should win many friends. The cheapest colour display from Apple until now has been the high-resolution 13in colour monitor, priced at \$1911. Lose an inch and the price drops to under \$1000. The new display device has similar lines to the 13in monitor, but lacks a coloured Apple logo. In fact the only adornment you'll find on the front is a green power-on LED.

Contrast and brightness knobs are on the right-hand side. At the rear is a permanently connected video signal cord, a

Windows versus Finder

Amstrad isn't the only company looking nervously at the new Macintoshes. The Windows community will also be worried, because the Macintosh operating system makes Windows look second rate. The reason is not only that the Macintosh has been around since 1984 — so has a swag of applications — but that the entire platform is more integrated. Almost all Macintosh applications use the same commands for opening and closing files, cutting to the clipboard and pasting applications. The uniformity of the interface makes learning new programs much easier. Windows is yet to achieve that uniformity.

Where Windows 3.0 does have an advantage is in multi-tasking. With a 386SX, 386 or 486 CPU and enough memory, several applications can be run concurrently. With the Macintosh MultiFinder, several applications can be held in memory, but true multi-tasking will have to wait until System 7.0 is released next year.

In use, the Macintosh environment wins most votes. Installing new system resources is simply a matter of copying files to folders using the control panel or the Font/DA installer. With Windows, installing new applications involves messing around with PIF files which, for the novice, is offputting. The range of Windows 3.0 applications is also limited compared to Macintosh applications.

Windows 3.0 comes with a more comprehensive range of desk accessories, including a word processor, paint package, communications package and two games. It also makes good use of the colourful MS-DOS environment. With Macintosh, colour is still an afterthought.

In 12 months' time, when Release 7.0 is here and Windows has shaped up, the comparison may have changed. For now, it is thumbs up to the Macintosh, the king of graphical user interfaces.

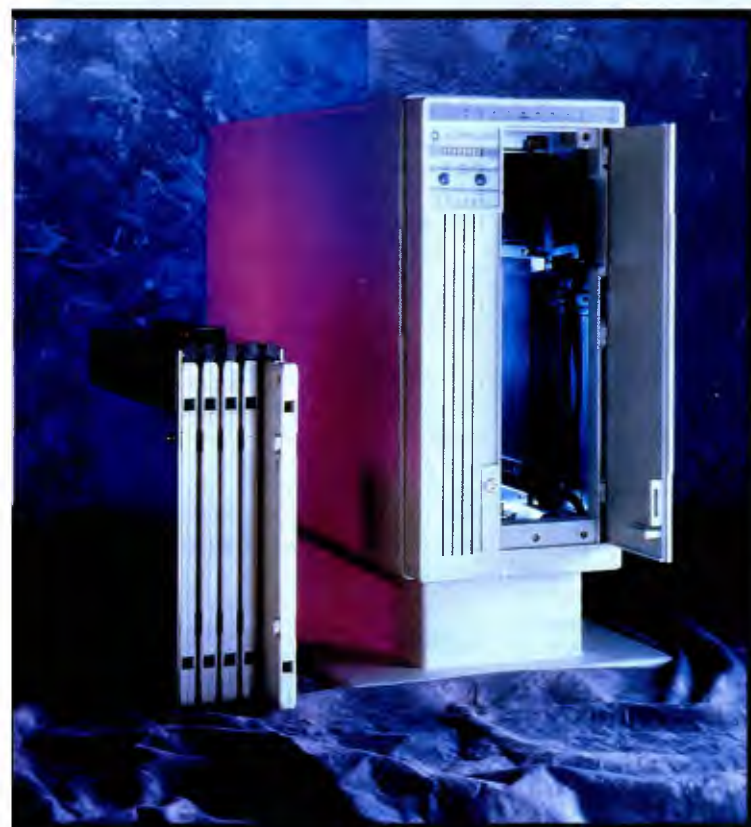


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Like the LC, the IIsi is equipped with sound input circuitry



security bracket slot, a power socket and a lockable power button. A male/female power cord lets the monitor be powered through the IIsi.

Four rubber feet support the monitor, and there is also a circular cutout that could be used by an accessory tilt-and-swivel stand. That is definitely an add on most users would want to purchase.

Image quality is excellent. The 640 by 480 pixel display is flicker free and has a substantial black border that makes it stand out clearly.

Only well-heeled Mac users will be accustomed to colour — most live in a high resolution, but very grey world, as many applications work quite well without colour. So what are the advantages? On the desktop, the immediate sign of a colour display is a coloured Mac on the welcome screen and a multi-coloured Apple logo at the top of the DA menu. Icons can be assigned any of seven colours; highlighted text can be given any colour from a colour wheel; and the desktop backdrop can be given a multi-coloured pattern.

With coloured icons, files can be sorted by colour, giving users an easy way to impose non-standard display orders. A growing number of applications are using colour — desktop publishing, graphics, CAD and project management software. Even word processors, such as Microsoft Word and Nisus, use colour.

The mono Mac will not disappear overnight, but this monitor, along with the Mac LC which next year will offer colour for \$2695, would encourage even more users to make the change.

Documentation

Apple has always offered excellent documentation. All Macintoshes come with a Macintosh Basics floppy disk that introduces new users to the Mac interface. A HyperCard stack gives an audio and graphic overview of the features, paying particular attention to the sound, video and expansion capabilities of the IIsi.

The 403-page main *Reference* manual was written before the Classic and IIsi

came on the scene. While almost all the material is relevant, it needs two supplementary manuals to explain the new sound features, detail the technical features of the IIsi and give simple set up instructions.

The *Reference* manual is comprehensive, and manages to cope with all Mac models in its stride. Utility applications and DAs are carefully explained and there is an excellent glossary. Also for all Mac models is a *Getting Started* manual, covering the Finder. Additional documentation includes a booklet on network installation and an all-too-brief guide to HyperCard (go to a good computer book store and pick up *The Complete HyperCard Handbook* by the author of HyperCard, Danny Goodman).

Conclusion

Given the price, it is hard to fault the Classic. It is the first entry-level Macintosh with a mass market price. As such, it should win over all those who wanted Macs, but couldn't afford them. The Classic will also answer the prayers of network managers, as the price and performance makes it an ideal network workstation.

But the Classic is a limited Macintosh, certainly in a standalone environment. For starters, it has minimal expansion capability. As more Mac applications start to use colour, and as areas such as hypermedia emerge, the urge to add colour displays, more sophisticated I/O devices and so on could become irresistible. The SCSI port enables external storage media to be used, but sooner or later, a more open Macintosh will become very tempting.

The IIsi would be a logical step up, even if the sound features a smack of gimmickry. The next model up from the IIsi is the IIfx, which boasts three NuBus expansion slots but at an extra \$3000. Many users will find a single slot is all they need.

At the price, it is hard for a Mac enthusiast to go past the IIsi. But a word of warning. The much-touted \$6995 price does not include a monitor or a keyboard. With a 12in mono monitor and standard keyboard, it costs \$7780; for colour, \$8230. At that price, it starts to look price/performance competitive against the 386 MS-DOS opposition, particularly when you add a mouse and Windows 3.0 to the MS-DOS price.

The real MS-DOS competitors will be the Macintosh LC, but we'll have to wait a few months for that. The IIsi is more likely to appeal to those Mac Plus and Mac SE users out there who want more grunt and the means to add colour or an expansion card. For them, the IIsi is a great choice.

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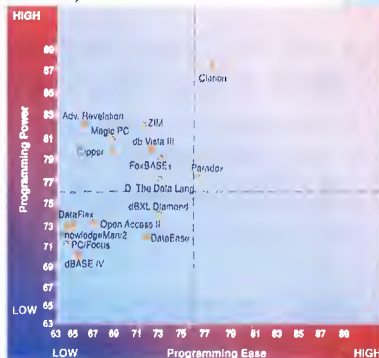
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286 laptops: computing on the go

Since the beginning of the computer industry there has been a quest for more computing power in smaller packages. Just a few years ago, laptops were laughable machines with dismal displays, poor storage capabilities and little computing power. And, they were very expensive. But that situation has changed dramatically.

These days, there is a plethora of laptops on the market powered by Intel 80286 processors running at high CPU clock speeds. Many of them come standard with VGA graphics, 40M hard disks and can be expanded to 4M of RAM or more on the system board. They also have much the same connectivity, if not quite the same expansion, capabilities as standard desktop PCs.

Many PC users have recognised that the added functionality provided by a powerful laptop makes it a viable alternative to a desktop model at a comparable price. All of the laptops tested in this review have the ability to connect to an external CRT monitor and keyboard, and Olivetti's M211V had the option of a 100M hard disk. With this sort of power and connectivity it is not too difficult to imagine why some users are throwing out their desktop CPU units and just keeping the screen and keyboard.

Although there has been a great improvement in laptops over the past couple of years, there is still a long way to go. Most of the machines tested may be laptops by definition, but in reality there is no way you would ever sit in a plane or train with one perched on your knees. Manufacturers are only just beginning to understand that, to most users, a battery-powered PC is pointless if it is

Battery-operated laptops are certainly improving — but they haven't reached perfection yet. Stan Beer evaluates 10 players in the 80286 laptop category.

too heavy to be comfortably used in situations where power is not available.

Only one machine of those tested, the Bondwell 310B Superslim, was a laptop in the true sense of the word, weighing only 3.8kg. Most of the others came in around seven to eight kilograms — far too heavy to travel with comfortably. The technology exists to make a lightweight machine, as we saw last month in our review of notebook-sized laptops. It is hard to understand why only some manufacturers have managed to release one.

Prices have come down a long way in the last couple of years, but it is still very expensive to own one of these portable PCs. A 80286 laptop will set you back anywhere between \$3500 and \$6600, although most distributors admit that their recommended retail price is well above the street price.

All laptops tested had certain features in common. They had embedded compact keyboards and lift-back screens with adjustable brightness and contrast controls, and 80 character by 25 line displays. All had the option of nickel-cadmium battery or AC mains power, and came with 1M of RAM on the motherboard and either a 20 or 40M hard disk. Except for the Diplomat 286, every laptop in the review had a LCD screen.

In general, the machines tested performed reasonably well. That is, they had comparable benchmark performance to 80286 desktop models on the market. The offerings from Olivetti, Samsung, Teco and Atronics had excellent VGA displays while those from Hitachi and Spectrum Communications delivered only CGA quality.

Three machines stood out from the rest: the Bondwell because of its reasonable weight



and size, and the Diplomat and Olivetti because of their superior all-round performance. It was interesting to note that the machine with the best price/performance ratio, the Diplomat, was the one that did not pretend to be a true laptop in that it had no battery option and sported a gas plasma display.

Atronic Diplomat 286

This is not a true laptop in the sense that it does not have the option of being driven by a battery. Unlike the other machines reviewed, the Taiwanese-made Diplomat has a gas plasma display and requires AC mains power. However, in all other respects, a valid comparison can be made as the Diplomat offers very high performance for a comparatively low price.

At 8kg, the Diplomat is among the heavier machines tested, and also has the largest footprint. It comes with a good carry bag, and is quite portable. There is not too much in the way of bundled software except for a choice of MS-DOS 4.01 and GW-Basic, or DR-DOS 3.41 and GEM Desktop.

Despite being written in Taiwanese English, the manual is acceptable, although it lacks diagrams and clear instructions on how to expand the machine. There is a very good chapter that introduces novice users to MS-DOS.

The Diplomat is one of the more expandable laptops with a proliferation of ports and two industry-standard expansion slots. In addition to two serial ports and one parallel printer port, there is provision for an external monitor, external keyboard and an external floppy drive — either 3.5in or 5.25in. The motherboard can take up to 4M of RAM and an

Benchmarks

Atronic Diplomat 286

CPU	12.9
Memory	25.6
Disk	2.2
Video	3.1
APC index	6.9

optional 80287-8 or 80287-10 numeric coprocessor.

The VGA driven orange-on-black gas plasma display has better clarity than all the LCD monitors in this bunch and there is no keyboard lag. The monitor is configurable using software utilities provided on a diskette. Unlike the other review machines, the Diplomat has a separate numeric keypad included on its 85-key compact keyboard. A 40M hard disk comes standard and an optional 100M disk is available for storage-hungry users for an extra \$700.

Value for money is one of the particularly strong points of this PC. The Diplomat, driven by an 80C286 processor running at 20MHz, has among the highest benchmark results and is one of the lowest-priced machines. Those two factors make it worth considering.

The Diplomat is a viable alternative for users who do not need to use a portable PC at locations without AC power.

Bondwell B310 Superslim

The first impression one has of this Hong Kong-manufactured laptop is that it lives up to its superslim name. Portability, ease

of use and convenience appear to be factors that take precedence over all else in its design. Although the B310 is well engineered and quite powerful, the overriding preoccupation with space-saving is responsible for some drawbacks when compared with other 80286 laptops.

Bondwell claims that the B310 is slim enough to fit inside an ordinary briefcase and that is exactly how it was packaged for review, complete with slim power transformer, slim spare rechargeable battery pack and slim manual. The neat little machine measures 5.5 by 33 by 31cm (HWD), and weighs only 3.8kg, making it an ideal travelling companion.

Like most of the other laptops, the B310 can use either a rechargeable Ni-Cad battery pack or AC mains power through a transformer.

One of the pleasing features of this laptop is its simplicity: everything is accessible and easy to use. This is just as well because the user's manual is about as thin as they come and can easily be read in one short sitting. However, with a computer of this nature, anything that is not in the manual was probably not meant to be known. It is mainly concerned with details such as how to change the battery pack, how to connect peripherals, how to use various ROM-resi-

Benchmarks

Bondwell B310 Superslim

CPU	8.8
Memory	15.7
Disk	2.6
Video	3.6
APC index	6.0

dent configuration utilities, and getting the new user up and running.

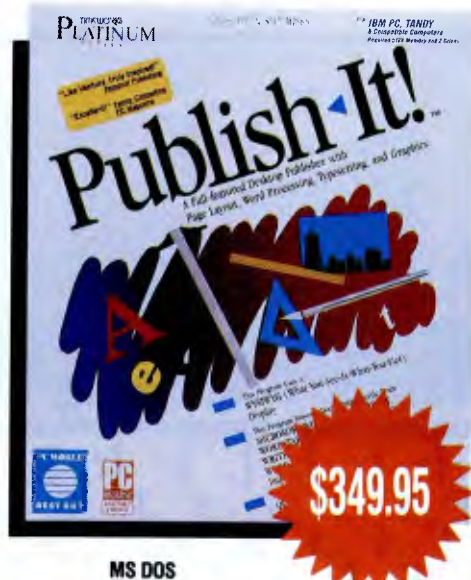
Other documentation included with the package is the MS-DOS 3.3 and GW-Basic manuals rolled into one compact paperback version. This manual, like the computer it comes with, is designed to travel. It may not contain quite the detail of the standard library versions but should be adequate for most users. The system software and GW-Basic are provided on one 3.5in diskette.

ROM-resident utility programs enable users to configure the B310 to automatically check battery charge, switch between the LCD monitor and an external CRT screen, configure the keyboard and set an automatic power down for the screen to conserve energy. The PC configuration setup is also ROM-resident. In addition, there is a handy menus program on the hard disk that allows the



The Atronic Diplomat 286: a laptop so long as your knees are near a power outlet

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B310 to be configured so that users are insulated from the DOS prompt.

For such a tiny machine, the B310 is a relative power-house and rates highly in the benchmarks. The low power consumption 80C286 zero wait-state CPU running at 12MHz performs better than many of the desktop 80286 machines on the market (for example, has an index of only). The B310 comes standard with 1M of RAM expandable to 2M, a 40M Conner hard disk drive and 1.44M 3.5in disk drive. There is one Centronics parallel printer port, two RS-232C serial communications ports, and an RGBI video port to support an external monitor.

Want expandability? Forget it. The extra 1M of memory is as far as you can take it. There are no expansion slots, no room for a coprocessor on the motherboard and no graphics upgrade available. Basically, what you see is what you get — if you want more, buy something else.

Two spring-loaded retaining clips slide forward to release a pop-open 10.5in LCD screen. The backlit screen is small but just large enough to allow an 80 character by 25 line display. Screen contrast can be adjusted using a sliding switch near the top of the keyboard. Overall readability of the display is not good for those wishing to work on detailed documents for lengthy periods. This is disappointing for a computer with such power, and is due to the low-resolution CGA graphics standard supported. Forget about using the B310 for anything more graphics-oriented than a spreadsheet, even with an external monitor.

Since the B310 does not appear to be suitable for graphics, all that power, memory and disk space must be intended for some other compute-intensive applications such as databases and spreadsheets. If that's the case, it is hard to understand why no provision has been made for an optional 80287 numeric coprocessor on the motherboard.

The compact 81-key keyboard has a nice solid feel and features a numeric



At 3.8kg, the Bondwell B310 Superslim is an ideal travelling companion but is limited by its expansion capability

keypad overlaid on alphabetical keys. The numbers are, however, difficult to read. Most keys are in logical positions, though, and users of 101-key extended keyboards should not have too much trouble adjusting to the cut-down format. Fold-away legs on the underside of the unit enable the keyboard to sit up at an angle if required.

The B310 comes standard with a one-year return to place of purchase warranty. It is a nice, compact and powerful machine suitable for users who need to regularly lug a computer around with them. Insurance salesmen would probably be prime candidates, as would executives on the move who need spreadsheeting and word processing applications. With an upgrade to VGA and the option of a coprocessor, the B310 would become a far more attractive buy.

Hitachi HL400/021

This 7.3kg laptop is an average performer compared with the rest of the bunch. It

is among the lower priced machines but also scored in the lower bracket of benchmark results.

The Japanese-made HL400 comes with the usual accessories one expects with a laptop of this type, including a carry bag, a rechargeable nickel-cadmium battery with AC adaptor and, thankfully, an operating system — MS-DOS 3.3. But there is little else to entice a buyer away from one of the more fully-featured laptops at a similar price.

Hitachi seems to have opted for no-frills functionality above all else with this product and this is typified by the documentation. Unlike other slick production user manuals, this one does not have a fancy glossy cover and coated pages. However, it is neatly formatted and contains all the necessary information, including clear instructions and diagrams.

Two industry-standard expansion slots give the HL400 good expansion capability. Adding an expansion board isn't an easy task, but it at least doesn't

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Benchmarks

Hitachi HL400/021

CPU	7.5
Memory	15.0
Disk	1.2
Video	3.9
APC index	4.9

involve dismantling the keyboard, as is necessary with the Kambrook Chaplet LA-30A.

The motherboard only has the option of 1M or 2M of RAM and a coprocessor, but it must be open to question how many users would actually require more than this in a PC of this power. Connectivity capabilities are reasonable with one parallel and two serial ports, as well as external keyboard and CRT monitor sockets. There is no provision for an external floppy drive.

The video and disk storage capabilities of the HL400 are disappointing. With an 11in blue LCD display, driven by a low-resolution CGA graphics card, readability was poor compared with most of the other laptops tested. The 20M hard disk also had the lowest benchmark rating.

The 81-key compact keyboard was quite good, with a nice feel and an easy to read numeric keypad overlaid on the alphanumeric keys.

The Hitachi HL400 gives reasonable performance for a reasonable price; however, some improvements such as VGA graphics, a good 40M hard disk, and perhaps some added extras would make this laptop a winner.

Kambrook Chaplet LA-30A

Unless you have legs like iron man, it is best not to think of this Taiwanese-made computer as a laptop. The LA-30A is rugged, solid, portable and expandable but also very heavy and comparatively expensive for what it offers.

Despite having a large footprint and weighing in at a whopping 8.5kg, the LA-30A is actually quite portable. A standard accessory is a handy padded canvas carrying case made to exactly the right dimensions. What is even more impressive is that users don't have to be particularly careful about how they pack things. There is plenty of room for everything, including documentation, cables and adaptor.

The LA-30A comes with an internal rechargeable battery and an AC adaptor. The battery is obviously not meant to be removed as the user manual does not reveal its whereabouts. What happens when it can no longer be recharged is a mystery to which perhaps only Kambrook, the Australian distributor, knows the answer.

The documentation provided includes a comprehensive user manual as well as full-sized DOS 3.3 and GW-Basic manuals. The user manual is quite detailed but has some puzzling aspects. For instance, it has a specifications section that gives detailed information about the hard disk drive but does not mention the CPU or memory. In general, however, it is a good manual that discusses details such as how to add a coprocessor and memory to the motherboard and how to plug option boards into the two half-size expansion slots.

The manual needs to be detailed, because adding RAM to the motherboard is

difficult and involves dismantling the whole machine. Adding expansion boards is much easier — simply remove the rear cover of the machine.

The monitor flips back to reveal a 12in backlit LCD screen that has an adjustable contrast switch. The screen has a normal or inverse video toggle button and is keyboard configurable to either CGA or Hercules monochrome graphics standards. Using the inverse video together with Hercules mode produces a readable output on the LCD screen. A dual frequency video port enables an external monitor supporting either graphics mode to be connected. If a higher graphics standard is required, an EGA or VGA board can be added to one of the expansion slots.

As well as the video port, there are two serial, one parallel and an external keyboard port. The solid 81-key compact keyboard is well designed with all keys positioned logically. It is almost a standard 101-key extended keyboard without the numeric keypad. An easy-to-read numeric keypad, activated by a Num Lock key, is overlaid on alphabetic keys on the right-hand side of the keyboard.

The LA-30A is quite expandable for a laptop. Apart from two half-size expansion slots — one 16-bit and one 8-bit —

Benchmarks

Kambrook Chaplet LA-30A

CPU	5.6
Memory	15.0
Disk	2.2
Video	2.8
APC index	4.8

the motherboard can be configured to take 5M of memory and an 80287 numeric coprocessor. A 20M Conner hard disk drive is standard; a 40M Conner drive is optional. This is a little disappointing, considering the price of this machine.

In the performance stakes, the base configuration LA-30A is not particularly high on the list of 80286 laptops tested. No doubt a 40M drive and a few added options would improve this standing considerably. However, the user must then decide how much extra it is worth spending on a laptop of this class.

Amstrad ALT-286

This is a solid, well-engineered, Japanese-made machine with good graphics capabilities. It also has fairly good perfor-



Hitachi's laptop: slow, boring and with a low-capacity hard disk



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mance and expansion capabilities. However, the 7kg ALT-286, like many other laptops, is uncomfortable to travel with. The unit can be carried around the office or home using a retractable handle but, since there is no carrying case, users will have to rig up something for themselves if they want to take it travelling.

A very good user manual is bundled with the machine, together with a paper-back guide to MS-DOS. The manual covers all the essential details of how to set up and configure the ALT-286, as well as clear instructions on how to expand the machine by plugging a board into the single half-size AT expansion slot and adding memory or a coprocessor to the motherboard. MS-DOS 3.3 is the only bundled software.

When it comes to accessibility for upgrade purposes, the ALT-286 is exceptionally well-designed. Upgrading memory or adding an 80287 numeric coprocessor to the motherboard are almost trivial tasks — simply undo three screws in a panel on the underside of the machine. The panel lifts off to expose the motherboard, complete with a spare socket for the coprocessor and SIMMs (single in-line memory modules) fitted into sockets. Similarly, adding an expansion card involves simply undoing two screws at the back of the unit to expose the spare slot.

In addition to the usual serial and parallel ports, the ALT-286 has provision for an external keyboard, CRT monitor and 5.25in floppy drive. Two banks of DIP switches are used to control the hardware settings of various features including the size of RAM, CPU wait and CPU clock speed. The machine is software configurable using a system setup utility program from Phoenix Technologies.

One of the ALT-286's strong points is its graphics capabilities. A standard 12in backlit LCD screen flips back when two catches on the sides of the unit are released. The screen is adjustable by contrast and brightness controls as well as an inverse video switch. The clarity is exceptional due to a VGA card that comes standard with the machine. The ALT-286 also supports most of the other major PC



The Kambrook Chaplet LA-30A proved to be rugged and expandable, but tipped the scales at a hefty 8.5kg



The Amstrad ALT-286 produces superb graphics on its 12in backlit LCD screen

graphics standards, allowing virtually any type of standard external CRT monitor to be plugged in.

The keyboard is a solid, compact 85-key unit which is set on a gentle slope to give the user a comfortable ergonomic feel. A numeric keypad is overlaid on alphanumeric keys and is easy to read because the numerals are marked in blue on the top-face of the keys as opposed to the front-side. A nice additional touch is the provision of a pad of removable extra keys that can be used to tailor the keyboard for different countries.

A 20M hard disk drive is the only option available. It is difficult to understand why, considering the machine's memory expansion capabilities and power. Users wanting the luxury of a 40M drive will have to pay the extra premium

for Amstrad's 386SX laptop model.

As far as value for money is concerned, the ALT-286 is quite good. A 40M hard disk, a well-designed carry bag and the absence of two or three kilos would turn 'quite good' into 'excellent'.

Benchmarks

Amstrad ALT-286

CPU	7.9
Memory	14.1
Disk	2.4
Video	3.6
APC index	5.6

Datamini LA-40

On first impression, this elegant Singapore-assembled number looks close to my idea of what a 286 laptop should be. It has a 40M hard disk, comes with a good carrying bag, weighs 6kg — a trifle too heavy but tolerable — and has a small footprint. But, first impressions can be deceiving and the LA-40, although a reasonable buy, is not exactly a star performer...

The first disappointment I ex-



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Benchmarks

Datamini LA-40

CPU	5.7
Memory	10.2
Disk	2.3
Video	2.3
APC index	4.2

perienced with the LA-40 is the documentation — or rather the lack of it. The very thin user manual provided with the review machine was appalling to say the least. Users are treated to a detailed diagram on how to undo two screws to change the rechargeable Ni-Cad battery, but there is not even a hint of how to access the motherboard or proprietary expansion slot.

Flipping back the monitor reveals a smallish backlit LCD screen with average clarity, in spite of an internal EGA card. Despite adjustable contrast and brightness controls, the screen definition was only acceptable. A setup program enables users to select reverse video which is a slight improvement.

At the back of the machine are the standard one parallel and two serial ports as well as a numerical keypad socket and an RGB video port. The 84-key compact keyboard layout is par for the course. It has the usual features, such as an overlaid numeric keypad, but is set back from the front of the machine so the user's hands have to clear a 7cm-wide ledge to reach the keys. This can either be seen as an advantage or disadvantage, depending on whether or not you want a ledge on

which to rest your wrists. Many users may also find that the keyboard is raised a little too high for their liking.

The LA-40 has reasonable expansion capabilities, and the motherboard is able to hold 3M of RAM and an optional 80287 numeric coprocessor. There is also a proprietary 16-bit expansion slot that the manual promises can be used for additional memory or graphics card. However, this slot will have to lie idle for the moment as there are no boards available for it yet. It would have been wiser for the manufacturer to opt for an industry-standard slot.

This machine performs reasonably well, but is significantly slower than others in the bunch and comes in with the lowest memory benchmark rating. The price is also in the lowest bracket, which is certainly a mitigating factor. The Datamini LA-40 does have some good features, but it needs a little more development.

Olivetti M211V

Despite some serious drawbacks, this laptop is a very classy machine. Its main problem is its outrageous price tag — a recommended retail price almost double that of some of the other machines tested. Additionally, it is annoying to find no operating system bundled with the unit, upping the cost even further. Other minuses include its 7kg weight and lack of carrying case. But there are a number of positive features associated with this high-performance, Japanese-made computer.

The user manual is easy to understand, and descriptions are complemented by a separate illustrations booklet. The manual thoroughly details the system's

Benchmarks

Olivetti M211V

CPU	7.7
Memory	20.8
Disk	2.8
Video	5.7
APC index	7.1

features, and concise instructions guide the user through the setup procedure. Importantly, users are generally left in no doubt about what they can or cannot add to the machine or how to go about it.

As with most 80286 laptops, the M211V comes standard with 1M of RAM on the motherboard. Either 1 or 4M memory expansion boards can be plugged into a proprietary slot. Simply unclip a plastic panel to expose the memory, undo a single screw, plug in the board, secure the board with the screw, and snap the panel back in place. Similarly, it is just as easy to install an option board to the unit's half-size, 16-bit, AT-compatible expansion slot. Everything is accessible and, with the help of the manual, easy to understand.

The flip-back 12in LCD screen with adjustable contrast and brightness is driven by a VGA graphics card and has one of the best LCD displays of the machines tested. The screen is software configurable to give black characters on a white background or reverse. Either way, the clarity and sharpness is excellent. Alternatively, an external VGA colour CRT monitor can be connected to one of the serial ports.

A solid 82-key compact keyboard on the main unit can be expanded by connecting a numeric keypad to a socket on the side of the unit, or bypassed by connecting an external keyboard to another socket. The keyboard is adequate and has the usual numeric keypad overlaid on alphanumeric keys, although the numbers are difficult to read. The external keyboard socket can also be used to connect a PS/2-compatible mouse.

The M211V comes standard with a 40M hard disk and, according to the manual, there should be the option of a 100M drive. However, Olivetti Australia advises that this option is not yet available locally. The manual also mentions that there are further options of having a numerical coprocessor and a 2400bps integrated modem installed. It clearly states that these options must be installed by qualified dealer technicians. An Olivetti spokesperson confirmed that a numerical coprocessor can be added to the



Many users may find the Datamini LA-40's keyboard raised a little too high

Technical specifications

	Amstrad ALT-286	Atronic Diplomat 286	Bondwell B310 Superslim	Datamini LA-40	Hitachi HL400/021	Kambrook Chaplet LA-30A	Olivetti M211V	Samsung S3600	Sherry PRO 286/LT 16D	Teco LT3600
Distributor	Amstrad	Atronic International	Spectrum Communications	Datamini Personal Computers	Hitachi Australia	Kambrook Distribution	Olivetti Australia	Samsung (Australia)	Sherry Australia	Teco Australia
Telephone	(02) 316 5289	(03) 534 0708	(03) 818 3282	(03) 523 0006	(02) 929 8799	(03) 534 2200	(02) 748 2600	(02) 638 5200	(08) 212 5611	(02) 725 1233
Price of review configuration	\$3999	\$3995	\$3495	\$3495	\$3999	\$4500	\$6611	\$4490	\$4775	\$5787
Price of base unit	\$3999	\$3995	\$3495, add \$575 for extra 1M RAM	\$3495	\$3999	\$4500	\$6611	\$4190	\$4775	\$5787
Processor	80L286 running at 16MHz	80C286 running at 20MHz	80C286 running at 12MHz	80286 running at 12MHz	80C286 running at 12MHz	80286 running at 12MHz	80C286 running at 16MHz	80C286 running at 12MHz	80C286 running at 16MHz	80C286 running at 20MHz
Coprocessor	Optional	Optional	None	Optional	Optional	Optional	Optional	Optional	Optional	Optional
RAM fitted	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M
Maximum RAM on motherboard	4M	5M	2M	3M	2M	5M	1M	4M	5M	5M
Hard disk	20M	40M	40M	40M	20M	20M	40M	40M	40M	40M
Floppy disk	One 3.5in 1.44M	One 3.5in 1.44M	One 3.5in 1.44M	One 3.5in 1.44M	One 3.5in 1.44M	One 3.5in 1.44M	One 3.5in 1.44M	One 3.5in 1.44M	One 3.5in 1.44M, one external 5.25in 1.2M	One 3.5in 1.44M
Video standard	MDA, CGA, Hercules, EGA, MCGA, VGA	VGA, EGA, CGA, MDA, Hercules	CGA	EGA	CGA	CGA, Hercules, MGA	VGA, EGA, CGA, MGA	VGA, EGA, CGA, MGA	VGA, EGA, CGA, MGA	VGA, EGA, CGA, MGA
Monitor	12in LCD	10.5in gas plasma	10.5in LCD	12in LCD	11in LCD	12in LCD	12in LCD	10in LCD	10.5in LCD	11in LCD
Keyboard	Compact 85 key	Compact 85 key	Compact 81 key	Compact 84 key	Compact 81 key	Compact 81 key	Compact 82 key	Compact 80 key	Compact 81 key	Compact 82 key
Ports	Two serial, one parallel, one external CRT monitor, one external floppy, one external keyboard	Two serial, one parallel, one external keyboard socket, one external CRT monitor, one external FDD	Two serial, one parallel, one RGB video	Two serial, one parallel, one RGB video, one numeric keypad socket	Two serial, one parallel, one external keyboard socket, one external CRT monitor	Two serial, one parallel, one dual frequency video, one external keyboard	One serial, one parallel, one numeric keypad socket, one external keyboard, or PS/2-compatible mouse socket, one external CRT monitor	One serial, one parallel, one external keyboard socket, one external CRT monitor	Two serial, one parallel, one external keyboard socket, one external keypad socket, one external CRT monitor, one external FDD	Two serial, one parallel, one external keyboard socket, one external keypad socket, one external CRT monitor, one external FDD
Slots	One 16-bit half-length	One 16-bit AT-compatible, one 8-bit XT-compatible	None	One 16-bit proprietary	One 16-bit AT-compatible, one 8-bit XT-compatible	One 8-bit half-length, one 16-bit, half-length	One 16-bit half-length AT-compatible, one 16-bit proprietary for memory board	One proprietary slot for modem	One 8-bit XT-compatible	One 16-bit AT-compatible
Slots free in review configuration	One 16-bit half length	One 16-bit AT-compatible, one 8-bit XT-compatible	None	One 16-bit proprietary	One 16-bit AT-compatible, one 8-bit XT-compatible	One 8-bit half-length, one 16-bit half-length	One 16-bit half-length AT-compatible, one 16-bit proprietary for memory board	One proprietary slot for modem	One 8-bit XT-compatible	One 16-bit AT-compatible
Main unit size (HWD)	31 x 38 x 8cm	40 x 36 x 10cm	33.1 x 31 x 5.5cm	28 x 33 x 7cm	32.4 x 40 x 9.4cm	32.4 x 40.9 x 8cm	33 x 36.4 x 9.9cm	32.5 x 36.5 x 8.3cm	31 x 36 x 8.9cm	32.5 x 36 x 9cm
Weight	7kg	8kg	3.8kg	6kg	7.3kg	6.7kg	7kg	7.2kg	8.4kg	8.7kg

A new twist for laptops

Ever since RCA's early experiments in LCD technology in the late 1960s, liquid crystal displays have been the favourite for electronic designs. First in calculators and now in portable computers, these displays are in demand due to their small dimensions, light weight and low power requirements.

Computer users are never satisfied, however. We want more power, more speed and greater resolution in smaller, lighter packages that run forever on a single battery charge. Fortunately for our insatiable appetites, LCD technology is improving rapidly. In order to understand the improvements, we need to understand LCD technology in general. LCDs rely on strange compounds that act like solid oblong crystals, yet something like liquids.

Liquid crystals would simply be chemical oddities if not for two distinct traits. A layer of liquid crystals can actually twist light waves. Each pixel on a display requires a separate LCD cell; in each cell, a layer of liquid crystal material is sandwiched between two grooved surfaces. The crystals tend to line up with the grooves in these surfaces, and if these grooves are at right angles to each other, the crystals will shift their orientation depending on which surface they are closer to. Light waves will follow these changes in orientation and exit the layer twisted 90 degrees. The second trait is that you can get all the crystals to line up vertically, standing on end, simply by passing an electric current between the two surfaces. This allows light to pass through the layer unimpeded.

These two remarkable attributes make

LCD panels possible. A polarising filter on one side of the layer filters out all light waves except those that are oriented in the desired direction. The liquid crystal layer twists these waves so that when the light comes out the other side, it is oriented to pass through another polarising filter arranged at right angles to the first one, so the pixel appears bright. When transparent electrodes apply a charge to the two sides of the layer, the crystals line up so the light passes through unchanged; the light is then blocked by the second polarising filter since the waves are not in the correct orientation. Thus, the pixel is left dark, and the pattern of dark and light pixels forms the image.

Modern advantages

Compared with early LCD panels, today's products enjoy some distinct improvements. They are thinner, and there is greater contrast between 'on' and 'off' pixels. Active matrix panels are one new development that has made these improvements possible. Also known as TFT (for thin film transistor) technology, this approach places a transistor in each pixel; it permits more precise control of the voltages applied to turn a cell on or off. This also permits half-tone displays ('partially on' pixels), higher contrast and faster response.

Another advance relates to how the light is twisted in an LCD panel. The original designs always put the light waves through a 90-degree twist; this is called 'twisted nematic' (TN) technology. Supertwist nematic (STN) designs twisted the light waves 180 to 260 degrees; this

improved the contrast but also gave rise to the familiar yellow-green or bright blue displays that we associate with laptop screens.

Two liquid crystals twisting light in opposite directions eliminate the coloured effect of STN designs; these 'double supertwisted nematic' (DSTN) designs are the source of some of the black-and-white LCD screens in use today. Most recently, the compensating twists have been achieved through the use of plastic films on both sides of a supertwist layer; this technology is called a 'triple supertwisted nematic' (TSTN) design. This last breakthrough is responsible for making multi-colour displays practical.

A few portable computers already take advantage of these new technologies. Sharp has triple-twist monochrome screens on its newest notebook (see 'Notebook laptops', *APC* October). Dolch has a thin film transistor full-colour screen for its high-end 386 and 486 portables (see *First Looks*, *APC* October), and other TFT designs are expected later this year from Airis and Sharp, among others.

Problems still remain in LCD technology. In order to reach resolutions of 800 by 600 for colour portable screens, manufacturers must create panels that incorporate about 1.5 million perfect pixels. Since the newer LCD technology absorbs more and more light, we need brighter backlights that draw less power. So while you can get some impressive portable displays today, you will have to wait a bit longer before you can retire the heavy vacuum-tube monitor that sits on your desktop machine.

Alfred Poor

motherboard but was emphatic that the only methods of adding a modem to the system was through the AT-compatible expansion slot or by connecting an external unit to the printer port. It seems that either the manual or Olivetti is unclear on certain points.

After running the benchmark tests, it is obvious that this laptop is up with the best in this field. The machine literally flies and has superior performance to many of the 80386SX PCs on the market. It scored particularly well in the memory transfer and video sections of the tests, and had an exceptional overall performance rating.

Olivetti has produced a great product in the M211V laptop. It could be a kilo or two lighter, and the \$2000 to \$3000 extra you'll have to pay for the privilege of owning this machine is not so easily swept aside. There is no doubt that this is

a laptop worth having — but not at the recommended retail price.

Samsung S3600

It seems that most 80286-based laptops made these days weigh in around the 7kg mark and this Korean-made computer is no exception. Like many of the other rechargeable Ni-Cad battery machines reviewed, the S3600 is a couple of kilos too heavy for comfortable transportation. On most other points, including value for money, it is very good indeed.

The packing box that houses the S3600 is unusually large for such a small machine because the distributor, Samsung Australia, is generous with the amount of freebies that come bundled with the hardware. As well as MS-DOS 4.01 and GW-Basic, users get WordPerfect Executive, LapLink III and a handy carrying bag.

As a result, the amount of documentation provided is almost enough to fill a library. The user manual is excellent, providing a complete guide to the ins and outs of the S3600 for both the novice and professional user. Unlike most other user manuals, this one even had a glossary and an index at the back. There are also sets of manuals for MS-DOS 4.0 and the bundled software.

The 10in backlit LCD screen, with adjustable contrast and brightness, could be a bit larger. However, the internal VGA card produces exceptional clarity in either black on white background or reverse video modes. A VGA-compatible CRT monitor can also be plugged into a port at the back of the machine.

An 80-key compact keyboard with an overlaid numeric keypad provides most of the functionality you'll ever need. An external keyboard socket is

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Benchmarks

Samsung S3600

CPU	5.7
Memory	15.2
Disk	2.4
Video	3.8
APC index	5.3

also available if a full-sized keyboard is required.

A weakness with this machine is the absence of an AT-compatible expansion slot, although there is a proprietary slot for a modem. Users have the option of expanding the motherboard to 4M of RAM and installing either a 80287-8 or 80C287 numerical coprocessor. A 20M hard disk comes as standard, but for just \$300 you can have a 40M hard disk fitted. Performance is not a particularly strong point for the Samsung S3600, coming somewhere in the middle of the pack, but the amount of extra software and documentation, and reasonable price tag put this machine in a value-for-money category that benchmarks cannot show.

Sherry PRO-286/LT 16D

At 8.4kg, this Singapore-made machine is hernia material. It carries a hefty price tag as well, although the bundled software makes it a more reasonable buy than it may seem at first glance. In addition to the standard configuration of 1M of RAM, 40M hard disk, VGA-driven LCD screen, and 3.5in 1.44M floppy drive, come a number of tantalising extras. These include an external 5.25in 1.2M floppy drive, external numeric keypad, a Click Surgebuster power surge protector, complete with \$5000 insurance policy, a choice of operating systems, a carry case, a selection of shareware software and a copy of Exogen business software. In addition, the distributor, Sherry Australia, provides a two-year warranty.

The documentation includes an excellent user manual which gives all the necessary details for both novices and technicians. Users have a choice of operating systems and bundled software — either MS-DOS 3.3 or 4.0 bundled with GW-Basic, or DR-DOS 3.34 bundled with GEM desktop. The review unit did not include any of these manuals but presumably they come with the package.

A pleasing aspect of the PRO-286 is the number of ports and sockets provided. No other laptop tested had made specific provision for a 5.25in

drive, yet this can be quite an important function as the transfer of media from laptops to desktops is often required. Additionally, the machine has an external monitor port, two serial ports, a parallel port, and keyboard and numeric keypad sockets. All ports are configured by a bank of DIP switches on the side of the unit.

The expansion slot is only a half-size 8-bit, XT-compatible slot. Expandability on the motherboard is good with provision for a numeric coprocessor and up to 5M of memory using SIMMs. The motherboard is not that easily accessible to the novice user, unlike the expansion slot which simply involves unclipping a latch at the back of the machine.

The backlit LCD monitor gives a very clear and readable display, driven by a VGA graphics card, and is software configurable to support other graphics standards and inverse video. The 81-key compact keyboard is much the same as the others tested, except there is no overlaid numeric keypad since a detachable keypad is provided. A 40M drive comes standard with the unit.

High memory and CPU ratings contribute to a fairly good overall performance benchmark result. The unit did not score particularly well in the hard disk section, which lowered the score. On the whole, the Sherry PRO-286 must be considered among the better value for money 80286 laptops on the market.



Olivetti's laptop is superb . . . and the price reflects it



Samsung's S3600 represents excellent value for money

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*Pantone, Inc's check standard trademark for colour reproduction and colour reproduction materials.

Benchmarks

Sherry PRO-286/LT 16D

CPU	7.7
Memory	20.4
Disk	1.9
Video	3.5
APC index	5.7

Teco LT3600

Despite weighing a crushing 8.7kg and carrying a very high price tag, this Taiwanese laptop is close to being the pick of the bunch. If one is to believe benchmark results, then the LT3600 absolutely blows all the other machines away for performance. Driven by a 80C286 processor cranked up to 20MHz, it scooped the pool in the memory, video and overall performance sections.

Benchmarks aside, the 'Getting Started' section of the substantial user manual gives a fairly good overview of why this machine stands out from the rest. Quite simply, apart from its weight and having no bundled software or operating system, it combines the best features of the other laptops in one complete package. However, like a lot of Taiwanese documentation, the manual itself is only fair, lacking the clear detailed diagrams and instructions of some of the better laptop manuals.

The motherboard has a built-in VGA chip which drives an 11in backlit LCD screen with excellent clarity. The screen can be adjusted for brightness and software configured for reverse video. A 40M hard disk is standard and, in addition to the 3.5in 1.44M disk drive, there is a port for a 5.25in drive. The housing unit for the external floppy drive and a connecting cable is supplied with the package.

Like the Sherry PRO-286, the LT3600 has an abundance of ports. There are two serial communications ports, one parallel printer port, one external VGA monitor

Benchmarks

Teco LT3600

CPU	9.6
Memory	26.1
Disk	2.2
Video	7.4
APC index	8.0



The Sherry PRO-286/LT 16D has the provision for the addition of a 5.25in drive



The Teco LT3600: a star performer

interface, an external keyboard and numeric keypad sockets. A separate numeric keypad is supplied with the system to complement a fairly standard 82-key compact keyboard.

The LT3600 can be expanded by adding up to 4M of memory modules to the motherboard and an optional 80287 numeric coprocessor. Since this involves dismantling the whole unit and the manual's instructions are sketchy, it is probably best left to a technician. Adding an option board to the half-size AT-compatible slot is a different matter, since it is readily accessible by simply unclasp a plastic panel at the side of the machine.

A disappointment with the LT3600 is that, in spite of supplying a carry bag, a numeric keypad and a floppy disk housing unit, the distributor has not seen fit to

bundle the unit with an operating system. It is interesting to note that this is the case with the two most expensive machines reviewed.

However, it is in performance that this machine excels. Its benchmark results eclipsed even the more expensive Olivetti laptop and its overall rating was almost double that of the bottom performer.

When asked to explain why the LT3600 weighed so much, a representative from Teco Australia replied, "It's all battery." Well, it is true that rechargeable nickel-cadmium batteries are fairly heavy — usually about 1kg — but then all the lighter machines suffer from the same disadvantage. However, all of the machines are also lighter on performance.

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386SX: entry level business machines

Buying a 386SX system gives you access to the expanding array of 386-specific software packages. Jeremy Torr benchtests a selection of these new entry-level business machines.

The PC market today is in a state of change, and that applies equally to the product itself. Gone are the days of wondering whether the machine you are about to buy will keep up with the software to be used. Today's question is can the software use all the machine's power?

The standard XT PC has all but vanished, the 286 is being touted as a bottom-of-the-range machine, and users are laying down stocks of 486 super servers. But what about the not-so-rich users who want to multi-task, run Windows 3.0 and be able to use OS/2 when (and if) it arrives?

They can go for a relatively pricey 386 machine, but they'll have to live with the knowledge that it will be outdated within a couple of years, when the 586 becomes available. The sensible choice is to settle for a 386SX. Who wants yesterday's Beetle when tomorrow's Porsche will be better value?

The 386SX chips represent Intel's attempt to block the monster market it accidentally created through licensing 286 chip production to other manufacturers. Intel reasoned that if it could produce a 32-bit chip at around the same price as competitors' 286 chips, the world would assume its rightful place in the queue at the Intel sales counter.

To some extent this has succeeded, but at the expense of 386 sales. Most commentators now agree the sensible course is to start with a 386SX, then migrate straight to 486 boxes as prices fall. This guarantees 32-bit software capability, and is obviously cheaper than buying 386 machines for short-term use.



The 10 machines reviewed represent a wide spectrum of choice, from cheap to expensive, and from small to large manufacturers. It was pleasing to see that three machines were designed and built in Australia — who said the local PC industry was dead? Changing, yes, but not dead.

The 3000G is made in the US, and the attention to detail and quality of finish easily outstrips many locally-assembled clones. Once the five retaining screws have been undone, the substantial steel case lid slides off to show a large expanse of air and some neat assemblies. There is

Benchmarks

AGI 3000G

CPU	8.9
Memory	14.0
Disk	2.8
Video	3.5
APC index	5.9

no sign of any patch wiring, and all upgrade sockets, jumpers and switches are easily accessible.

A chunky 200 watt power supply is reassuring — there is no need to worry whether the power supply will cope with extra boards (there are five spare AT style slots, so you could easily build up quite a power drain). Standard ports — serial, parallel, keyboard and power in and out — are all on the back of the box.

The downside is the 3000G's appearance. Dull. Colour is standard clotted cream, the big red switch is on the right-hand side at the back, and the floppy is on the right at the front. You could work it even if you had been asleep since the first IBM PCs were released.

The drives fitted are a 44M Toshiba hard disk and a 1.2M floppy. There is still room inside the cavernous case for two further drives, both with external access. If you want more memory than the 2M the motherboard can cope with, there are two proprietary high-speed memory slots that allow up to 16M of RAM to run at CPU speed, not bus speed.

The monitor supplied is an NEC Multisync 2A, which behaved impeccably with the Tseng Labs VGA display card fitted. The combination gives crisp displays, but the second lowest benchmark video score indicates it would be sluggish on CAD or graphic-intensive programs.

The AGI keyboard, unusual in that it too originates in the US, is a delight to use. It features a semi-concave contoured key platform to ease touch typing, and has a positive yet soft touch.

The manuals supplied with the AGI, a

User Manual and a Tseng Labs VGA Card manual, are not comprehensive. Here the lineage of the AGI shows, with a definite OEM approach: 'here's the machine, now go and use it'. Descriptions of upgrades, jumpers, memory switches and so on are very clearly covered, but there is not much for the novice user. Likewise, DOS does not feature heavily in the list of attributes. The review machine came with the hard disk formatted, and was bootable, but there was no DOS on-board. This means the first-time user cannot even format a disk in the floppy drive, or make backups.

Overall, the AGI is a competent, reasonably-priced machine that should last for years. However, it is undeniably slow, mainly due to the poor memory result. Fitting it with faster memory would pep things up a bit, but that would also inflate the price. In the current market, the AGI does not really shape up — a fast 286 would be a better bet.

Alpha 386SX

Every once in a while the job of machine reviewer turns up a surprise. Just so with the Alpha 386SX. On first inspection the machine appeared to be a bog-standard, locally-assembled cheap clone with no outstanding features. First impressions agreed with this; the machine locked up on running setup, and refused to communicate in any way.

However, following a phone call to New Concept, which rapidly collected the machine and fixed the glitch in a couple of days, the now fully obliging Alpha proved to be one of the scorchers of the batch.

The case is a hefty steel affair, located by no less than nine screws and reinforced by steel tie bars from front to back. Tough would be an understatement. The front of the case is quite pleasing to look at, although the inclusion of the massive LED giving CPU speed is definitely overkill; a simple 'Turbo' light would be enough.

In addition to the front reset, power and speed buttons (and the overdone LED), both 5.25in 1.2M and 3.5in 1.4M

Benchmarks

Alpha 386SX

CPU	12.0
Memory	25.8
Disk	3.8
Video	5.2
APC index	8.9

floppy drives are provided — a useful extra given both formats are still used by software manufacturers.

Once the case has been removed, the internals show what is a fairly standard clone arrangement, with two spare drive bays in addition to the three already used. Motherboard construction looks sound, with a NEAT chip set and five of the eight AT slots free for expansion. An extra dedicated high-speed memory slot allows proprietary memory boards to be used.

One handy extra facility on the Alpha (and on the Microscience which shares the same motherboard) is the shadow RAM option. This copies system and video BIOS into RAM, and speeds up access considerably on BIOS calls.

The video card, a Tseng Labs Turbo Mega EVA/1024, carries a whopping 1M of video RAM. This gives a good refresh speed on complex graphic output, but is not as quick as some of the other machines. The display card comes with a range of software drivers and a set of adaptors for EGA and mono cables. The NEC Multisync 3D provided the output quality you would expect from the industry-standard monitor. It features a full set of electronic controls under the front flap.

The output card includes a games port in addition to serial and parallel ports. This seems pointless on a basic business machine, but it's there just in case you want to play shoot-em up games in your lunch hour. Layout of the slots is a little strange — one of the 8-bit slots is obstructed by the 16-bit disk controller cables, making it impossible to fit anything other than a short card.

The processor, a standard Intel 386SX, is inscribed with the 16MHz rating, so the machine is obviously being given an unofficial boost to 20MHz. This does not necessarily mean the CPU is working beyond its limits — only that Intel does not recommend it. Suffice to say many manufacturers do the same thing.

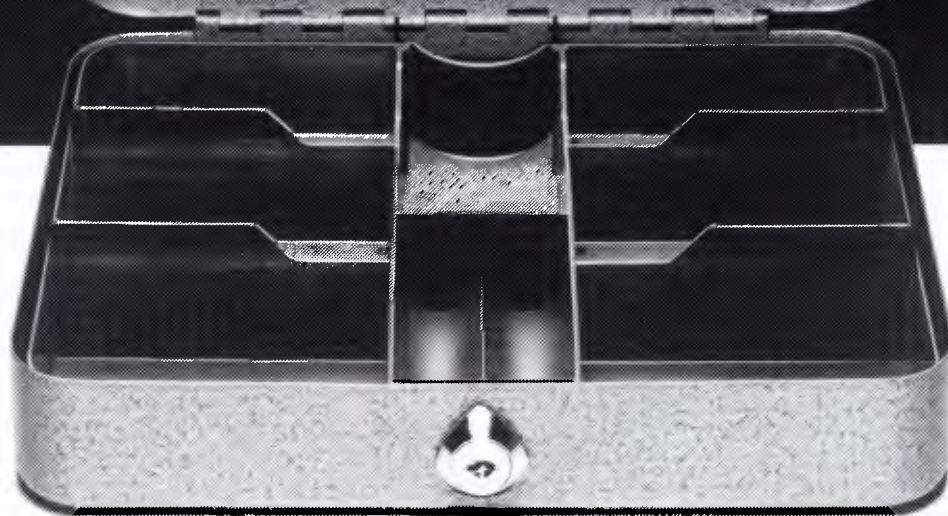
This fast CPU, coupled with a top memory score, means number crunching will be no headache for the Alpha.

The 42M hard disk, a US-made Quantum which rated a 19ms access speed, is

A semi-contoured key platform makes the AGI 3000G's keyboard a pleasure to use



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The Alpha 386SX has a solid case, reinforced with steel tie bars from front to back



one of the fastest in the bunch. The disk came ready configured with DOS 4.01 and a menu manager installed, as well as a VGA demo to impress your friends.

The keyboard supplied is a slightly clicky Taiwanese item, with a neat extra in the form of template cards for several software programs incorporated just above the function keys.

No DOS manual was supplied with the review machine, and the manuals (four very small ones) were for the individual components/cards, not the machine as a whole. This is becoming the norm for clones, but can be completely useless for the first-time buyer who needs an overall view of the machine as supplied.

Nonetheless, the Alpha — which is the second fastest overall and the cheapest — is an excellent buy. The backup service was competent and quick and as a result, I've almost changed my mind about cheap clones.

Apricot Qi 300

Apricot, which has pitched itself firmly into the corporate LAN market with its range of PC products, bills the Qi 300 (pronounced 'key') 386SX as the ultimate personal workstation. The implication here is that the machine will be primarily used for standalone computing on an executive desk rather than network applications, although LAN capability is built into the basic design. If executives are the intended market, the Qi 300 should be a winner. It is

relatively expensive, MCA compatible, and looks every inch the high-tech productivity tool.

Design is a major part of this image — even the packaging is conceptual! Once out of the box, setup and installation is straightforward. Apricot install and operation disks as supplied load and configure MS-DOS 4.01 very smoothly. The manual is helpful and well written to cater for all but the most technical user, although no DOS manual was included with the review machine.

The design of the angular and rakish casing makes the most of MCA's space-saving features, producing a very slim main unit that still has room for an internal tape drive. No provision is made for extra hard or floppy drives, but network connectors have their own space reserved in addition to the standard four slots.

One of the MCA 16-bit slots is used by the Seagate hard disk controller card, leaving enough room for modem and any other cards required in the remaining three.

Getting into the case is very easy. The injection-moulded top is unlocked, two thumbscrews undone and the top slides off. Quality design and manufacture is evident: lots of surface-mount chips; neatly folded controller cables; and sockets for coprocessor, memory slots and three special security devices.

The standard 640K memory can be upgraded to a total of 5M, but accessing the upgrade slots is complicated, requiring power supply removal.



A space is reserved on the Apricot Qi 300 for a network connector in addition to the standard four slots

The 3.5in, 1.4M floppy booted satisfactorily from the supplied disks but was reluctant to read from others written on a Toshiba. It also had occasional problems reading 720K disks, however this could be a one-off fault.

The case features an on/off switch on the right-hand side and there are lots of indicator lights (not all used) and cooling slots on the front. The Qi 300 has provision for an infra-red security card, but it was not fitted on the review model.

The Apricot monitor is worthy of note in that it combines four different display formats, all controllable from a switch on the front panel. Standard display is full colour VGA, but you can also switch through mono green, colour/blue background and colour/amber background to provide best legibility for the current software.

The display itself was not quite as crisp as some, but had slightly softer colour tone which proved easier for long-term use. The onboard VGA driver flagged a total of 11 BIOS level errors on our test, so make sure any tricky software you have will run before buying.

The keyboard continues the angular design feel, and is light but positive to use. It plugs into a mini DIN connector on the backplate, as does the bus mouse (not supplied). Other output ports are standard 25-pin parallel and serial.

As can be seen from the benchmarks, the Apricot was a top performer with impressive video display and CPU results. In all, the Qi 300 'Personal Workstation' is a very competent and fast performer. It is well designed and expandable, and

Benchmarks

Apricot Qi 300

CPU	10.0
Memory	20.6
Disk	2.6
Video	6.4
APC index	7.6

should be able to cope with the next phase in operating systems without overloading itself. It is expensive, but for those who don't want to buy IBM or Compaq, the Apricot is definitely a better looker.

Cleveland 386SX Tower

The Cleveland 386SX is one of two tower boxes in this review, hinting that the makers see their machine as a floor-standing powerhouse rather than a desktop

Q: Who am I?

A: I am Dr. Genius.

I am a computer expert, my theory is very simple....



Genius:

Education might probably be what makes you see through one thing, but makes you completely ignore another. The blind point of us is if we think education can do anything. One episode reminds me of this. Once, taking a friend with me to see birds in the Kuantu Nature Preserve and trying to make him happy, I found that the place, from his point of view, was only more lonely than other places and more muddy when we were rowing a boat.

Strangely speaking, even Pelicans, Snipes and Grebes know the Kuantu Nature Preserve is a marsh. This is why these birds choose it rather than somewhere else. But my friend does not. Birds might be annoyed at people's invasion of their place and think the rules of Nature were being disturbed. However, my friend did not notice that. I think the key point is that Kuantu Nature Preserve is a unique marsh, not only in space, but in time....

Arch Your sincerely

This is the opinion of an ecologist, Dr. Arch, on education. What's mine? Same as his.

Simply better

Dedicated to the field of computer science for such a long time, I finally realized the philosophy of "back to facile and nature through a state of exaggeration". At first, I thought that "Unique" stands for "excellence" and this deliberately distinguishes from others" is the best mark for uniqueness. Thus I developed a standard incompatibility with others through complicated computer theories. However, this standard was faced with the problem of self-limitation due to the inability to communicate with others, no matter how powerful its operating functions were. I then understood the magnificence of simplicity which is superior to complication.

After I gave up on the insistence of being incompatible, through revision again and again I came to the conclusion that simple is best. Through knowing how to cope with complex things by simplifying them, you'll get a chance to pit the few against the many.

Zero and One

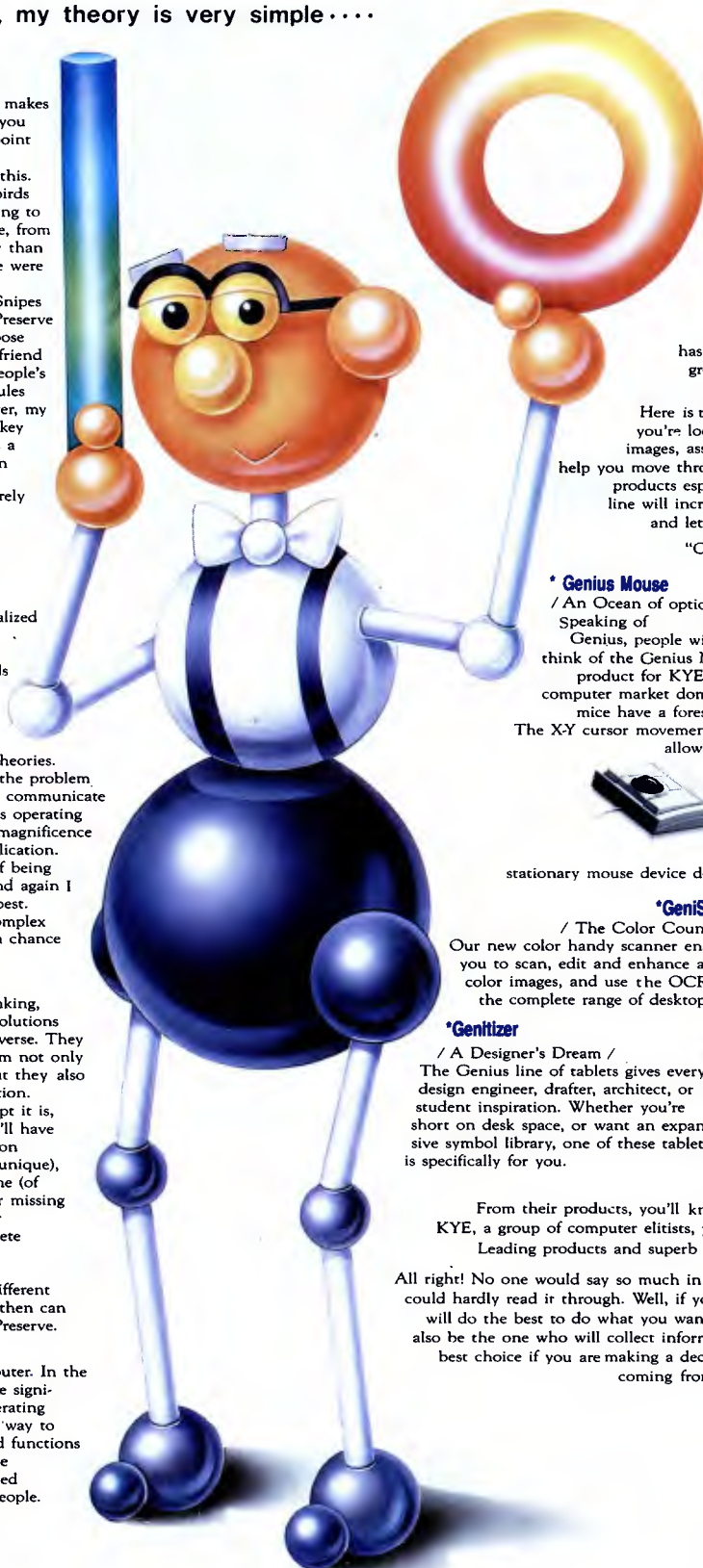
It is, from a course of complex thinking, only two simple elements, which give solutions to many unsolved problems in this universe. They are zero and one. Combinations of them not only create known and unknown futures, but they also offer us with infinite room for imagination.

So does education. A simple concept it is, though. Take advantage of it, then you'll have your problems solved. If you yet insist on being at the top of a mountain (being unique), to enjoy the splendour of the view alone (of incompatibility) you might be sorry for missing the spectacle of the blue ocean all your life. (missing the magnificence of complete communication with others).

Education is not for self-limitation, but for being able to see things from different perspectives. Open our minds, and we then can feel the uniqueness of Kuantu Nature Preserve.

Let's talk about my profession

So is the development of the computer. In the computer world, standardization is more significant than uniqueness. Humanized operating environments are the simplest and best way to teach people computers. Its complicated functions and cold exteriors made ordinary people hesitate to approach it. Highly developed technologies create distances between people.



With the revisions of technologies and the changing of people's notions, the computer is becoming standardized and its humanized design also softens the unfriendliness of its appearance. More efficient and powerful functions of input peripherals turn data entry into an easy and interesting job as well.

The Genius Family

KYE, which has been putting a great deal of effort into R&D and has dynamic marketing strategies, has grown faster than other firms in the computer field.

Here is the KYE product line-up. Whether you're looking for something to scan color images, assist you with your design work, or help you move through image or text files, there are products especially for you. Using the Genius line will increase your productivity immensely and lets you work with might redoubled.

"Genius", expanding your creativity!

* Genius Mouse

/ An Ocean of options /
Speaking of

Genius, people will think of the Genius Mouse since it was the first major product for KYE while they were just entering the computer market domestically and abroad. The Genius mice have a forest of features with stylish designs. The X-Y cursor movement and dynamic resolution features allow you to draw freely and smoothly.

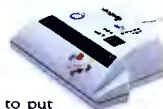


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The Genius line of tablets gives every design engineer, drafter, architect, or student inspiration. Whether you're short on desk space, or want an expansive symbol library, one of these tablets is specifically for you.



From their products, you'll know the quality of their designers. KYE, a group of computer elitists, pursues perfection and excellence. Leading products and superb R&D are the Genius men's goals.

All right! No one would say so much in an advertisement because people could hardly read it through. Well, if you can, you must be the one who will do the best to do what you want in this uncertain age. You might also be the one who will collect information and analyze it to make the best choice if you are making a decision. You will realize simplicity is coming from a process of complex thinkings.



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maid of all work — at least visually. The presentation of the Cleveland was good. It was well packed and surrounded by keys, manuals, power cords and utility disks. The sheer quantity of material in the carton bodes well on the attention-to-detail front.

The machine is quite conventional to look at — front push buttons for power, reset and turbo with accompanying lights, a pair of disk drives and a big LCD speed indicator, all oriented for vertical operation.

The case is of inferior quality to those of the other machines reviewed. One of the front slot blanking panels had a tendency to drop into the innards of the test machine and rattle around inside, and there were paint runs on the front plate.

The Cleveland 14in VGA tilt-and-swivel monitor had a better finish than the main unit but was dated in ap-



The interior of the Cleveland 386SX Tower is overgrown with lengthy, separate wires

Benchmarks

Cleveland 386SX Tower

CPU	7.2
Memory	20.7
Disk	2.4
Video	5.5
APC index	6.7

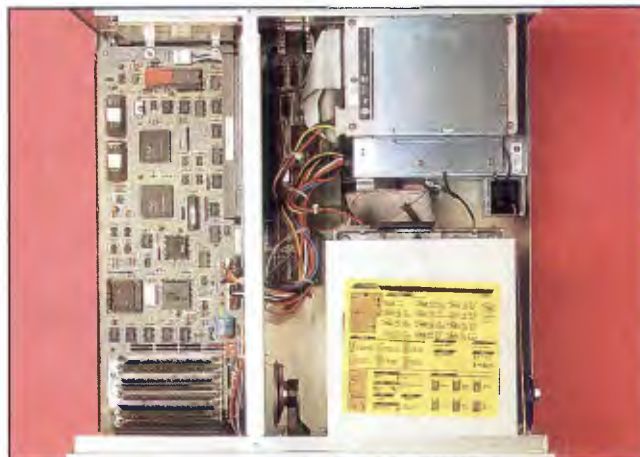
pearance, with a two-tone dark/light grey finish. Output quality was slightly fuzzy on fine detail.

Inside the main unit case, which simply slides off after three screws have been removed, is plenty of space. There are free slots for just one half-height and one full-height drive, but as both 5.25in and 3.5in drives are fitted this is probably enough unless you need multiple tape drives and extra hard disks.

An abundance of lengthy, separate wires adorn the interior. The use of add-in disk controller, and video and I/O cards adds to the cluttered impression. One of the extra cables provides the useful option of a front keyboard socket.

The machine came with a generous 3.6M of RAM, and its memory capability is rated up to 8M by a mixture of SIMMs and standard memory chips (I would have thought it easier to use either all SIMM or chip memory).

On the back panel, the video board carries both VGA and EGA sockets, and a DIP switch to change output. The other outlets on the rear are one 9-pin and one 25-pin serial, one standard parallel, keyboard and a switched mains. There are also blanking slots for three more ports if required, such as extra comms or printer ports.



The Iplex 386SXB/16 has an unusual two-part motherboard layout

The Seagate hard disk, which came ready formatted and fitted with DOS, was one of the slowest in operation, as reflected in the tests. Both floppies were also quite slow at initial disk access. Overall, the machine was by no means a scorcher, but performed capably.

The four manuals were comprehensive, but some were slightly Taiwanglese in wording. They were backed up by the original component manuals and accompanying utility disks.

One surprising feature of both the monitor and the main unit was the amount of radio interference. Noticeable TV flicker was produced — something most PCs manage to avoid. This is a major downfall, especially in today's market where there is a PC in many homes.

On the whole, the Cleveland is reasonable value. \$3299 will buy you a big box that works, scores reasonably well in the overall performance stakes, and looks impressive under the desk.

Iplex 386SXB/16

Although not one of the most vocal Australian PC manufacturers, Iplex has established a niche for itself in the major account league by producing capable, reliable machines at a realistic price. The

386SXB/16 is a good example of this — a well-designed and built mid-range machine with some unique features.

The box itself is unexciting, with a one-piece lid/case in standard light-battleship grey. The front panel sports a weak-looking power switch (which has a very unusual operating mechanism), a reset button and turbo, power and disk lights. Cooling slots are on the front, sides and back of the machine. It certainly shouldn't overheat.

The 5.25in floppy drive sits over two spare bays both with external access. This is achieved by mounting the hard drive out of the way over the power supply, which could explain the cooling slots.

The back panel has all ports and sock-

Benchmarks

Iplex 386SXB/16

CPU	9.0
Memory	13.5
Disk	3.7
Video	5.2
APC index	7.0

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ets mounted directly from the motherboard which makes for a neat wiring route for desktop use. The add-in card slots are horizontally oriented, and just four are available in standard trim despite there being five blanking plates on view.

The plastic case lid, fixed by six screws, lifts off to reveal the unusual two-part motherboard layout. The reasoning behind the split motherboard is that the half containing CPU and associated chips can simply be removed and updated without the use of special bus slots. The advantage is that standard AT 16-bit slots are used, and power does not need to flow through the bus as it is supplied via a separate cable assembly. The major features, such as disk controllers, video and ports are mounted on the sub-motherboard, which in turn carries a bus board that takes the CPU half-board.

The system works well, but take care if you add a numeric coprocessor as the board is unsupported at that point and would not take kindly to a clumsy approach. The major chips are all Intel, and mainly surface mounted. This seems to indicate no short cuts have been taken at the design stage.

Access to the SIMM mounts is good, and most switches and jumpers are accessible. The disk is the same Quantum model used in the Alpha, and although the Core speed is identical, the benchmark shows the onboard controller gives the best overall disk rating. Evidence of canny design here.

The quality feel extends to the own-brand monitor, which is a solid looking item with a good — if a little soft — display. The Taiwanese-made keyboard has a spongy feel and lacks a firm tactile feedback.

The manuals are good, and come in two binders so you don't lose them. One nice touch is the use of photos in the 'How To' sections, such as disk fitting, memory upgrade and extra cards. Other manufacturers please note.

Impressions of the Ipx are of a solidly-made, well-designed machine that should have a long useful life, thanks to the split motherboard concept. The only disappointment was the memory speed, but this could presumably be cured by the use of faster chips.

Microbyte PC 230SX

The first thing that strikes you about the Microbyte PC 230SX is its size. It looks more like a Bernoulli box than a computer — a little over 5cm high and the same footprint as its VGA colour monitor. Despite its size, it still squeezes in the essentials to make it work like any other PC. Designed and made in Adelaide, it shows that the word 'clone' does not



The rear of the Microbyte PC 230SX hosts eight output ports, excluding the two power sockets

necessarily mean a PC-compatible has to look like an IBM machine.

The front of the box has a single 3.5in, 1.4M disk drive in the centre, with room for another on its right. All switches are at the rear. The downside to this neat layout is that there is no power switch or indicator on the front, which means the machine could accidentally be left switched on.

The back panel of the Microbyte is literally covered with its eight output ports excluding the two power sockets (a SCSI and external disk drive).

This high degree of onboard connectivity offsets to some degree the provision of only two 16-bit slots oriented horizontally on the right-hand side of the machine. Only one can take a full-length board; the other has to be half length.

The main unit case opens with a couple of screws on the rear panel, and reveals how tightly the interior is packed. The power supply takes up a large portion of the left side, with the hard disk mounted over the centrally-mounted motherboard. With the exception of the memory upgrade sockets under the slot carriers, the motherboard is completely hidden by the disk. The keyboard is a Mexican Honeywell, with a positive but not too clicky feel. Microbyte has sourced its 14in VGA monitor from Philips, and drives it through the onboard VGA driver which uses 1M of video RAM. This combination gives a very rapid and clear display, as reflected by the machine's second position in the video benchmarks.

The Microbyte uses what is described as a 'soft' BIOS which can be updated by

software that resides on disk, and comes with a very comprehensive setup utility to configure memory, disks, ports and so on.

The review machine was supplied with DOS 3.3 and GW-Basic, and boasted original Microsoft manuals. The operation manual is a rather thin offering, but covers most essential operations and upgrades — except, curiously, memory upgrades. One useful tip contained in the manual is a warning against static damage as a result of using synthetic floor coverings. This should be copied by other manufacturers.

In use, the Microbyte was an average performer, but was definitely better than most on the video display front. The memory benchmark showed up the slowest marks which would indicate the need for faster memory for most applications.

The price of this machine puts it in the mid-range in terms of cost, and with a three-year guarantee and the good video performance, you could do worse than a 230SX.

Microscience 386SX Tower

The Microscience 386SX was an undeniable review winner on points, and was second cheapest. Despite these credentials, it had one or two slightly off-putting features. To be fair, this was the first machine of its kind to be sourced by Microscience, and production models will hopefully have overcome the problems.

The layout of the 386SX is standard tower: big speed LED, fat push buttons and both 3.5 and 5.25in drives already fitted. It is lighter than it looks, but does not feel flimsy. The steel case has a slightly sculptural plastic front panel and a massive red power switch on the left.

The floppy drives are both located horizontally, with two extra half-height and one full-height blanking plates. In fact, there are just two full-height slots spare under the 5.25in drive. The Seagate hard disk — which had all software drivers and DOS 4.01 already loaded — is located under the 3.5in drive and uses both extra half-height slots.

Benchmarks

Microbyte PC230SX

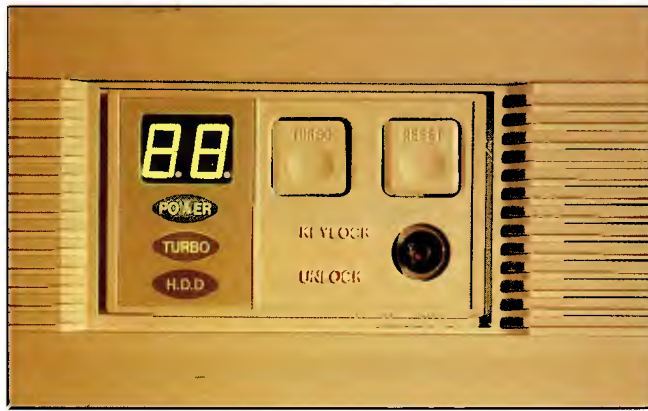
CPU	7.6
Memory	10.3
Disk	2.4
Video	6.7
APC index	5.9

PCBOOK command

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- Remarks:** The *filename* can designate any ASCII text file in which each line is terminated with a carriage return/line feed combination. Form feed characters can be added to force breaks in addition to those implicit in the 66 line (68 line if a header is used) page length.
- Any or all of the `/F`, `/P` and `/D` command-line switches can be used to create a one-line header that prints the filename, page number and date respectively, on all but blank pages. The `/W` switch causes lines exceeding 80 characters to wrap; by default such lines are truncated. Adding the `/2` switch causes PCBOOK to print to LPT2 rather than the default LPT1. (Use the DOS MODE command to implement serial connection, if desired.) The `/A` switch can be used to direct output to a file.
- PCBOOK sequences the page printing so that all side one pages are printed in one pass. The sheets are then put back into the LaserJet paper tray and all side two pages are printed. The finished booklet can then be created with a single fold. When using the normal (top) LaserJet output bin, the pass-one sheets should be reinserted in the paper tray without any relative change in orientation. If rear output from the printer is used, the sheets must be turned over as a group before reinsertion. To determine how many sheets will be required without automatically starting the print operation, use the `/C` parameter.
- The `/H` parameter provides on-screen help for the program, and `/S` sounds a beep as each printing pass is successfully completed.
- The source code for PCBOOK.EXE is written in QuickBASIC, and modifications will require Microsoft QuickBASIC 4.0b or 4.5, or the Basic compiler, version 6.0 or 7.0. Both the executable and the source file for PCBOOK can be downloaded from APC MAGNET.

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the copy and add it to
your manual

On the review machine supplied by Microscience, the hard disk light did not work and the turbo button did nothing. It is hoped these will be fixed before public release



I had problems with the 3.5in drive — it refused to reliably read 720K disks, even original software releases. 1.4M disks produced a better result but it was still unpredictable, issuing errors apparently at random. No problems were encountered with the 5.25in disk. There were further malfunctions: the hard disk light did not work (no great hardship, but if it is fitted it should work) and the turbo button did nothing.

The backplate of the Microscience has eight add-in card slots next to a range of six port outlets, five of which are not used. Power in and out complete the range of ports, with only the keyboard being motherboard mounted next to the sticker naming Honeywell as the service agent throughout Australia.

The cover is easily removed, and although it exposes a less cluttered layout

Benchmarks

Microscience 386SX Tower

CPU	12.5
Memory	25.8
Disk	2.8
Video	8.2
APC index	9.3

than the Cleveland, still seems to be dominated by cables thanks to the slot-mounted disk controllers, video board and I/O board.

The onboard memory is limited to 2M of standard memory chips, and there is an extra proprietary memory slot if you need more. Three of the spare bus slots are 8-bit, leaving two spare 16-bit slots.

Like the Alpha, the Microscience's Intel 80386SX chip has 16MHz stamped on it, but is being run at 20MHz. It is possible to slow it down if problems occur. The support chips are all C&T NEAT chips, but are not surface mounted.

The video board, a state-of-the-art

Canadian-built ATI VGAWonder, came first on the video benchmarks, even without the benefit of shadow VGA BIOS. The extra benefits of a bus mouse and software setup onboard are nice pieces of componentry.

The Microscience drives a Multisync 3D monitor, which gives a stable and crisp display ideal for high-resolution work, and has the plus of full electronic picture control.

Information on the machine is limited to a motherboard booklet, a booklet on the ATI video card and a basic I/O card technical sheet.

The keyboard is identical to that used by Wearnes — a positive yet easy-to-use unit with a good lead length.

Technically, the Microscience is a winner. It is cheap, very fast, has top-quality video output, and a good keyboard with a mouse thrown in. But the small problems like not reading disks and some features not working do raise doubts that need attention before public release.

Philips P3345

Philips, a Dutch-based electronics company and major player in the European home entertainment scene, is selling hard into the PC market. The blandly-named P3345 is its 386SX model, and like most of its hi-fi equipment has a decided-

ly European, rather than Far Eastern, look to it.

As an alternative to the massed buttons, switches and winking lights approach, the P3345 has just one power push button and one tiny hard disk light on the front of the grey case. Cooling slots relieve the otherwise plain exterior.

The matching grey tilt-and-swivel monitor is slightly more compact than many of the others in this review, but still features a 14in screen. The display is very crisp, yet not as harsh as some competitive models. The keyboard supplied is a

Benchmarks

Philips P3345

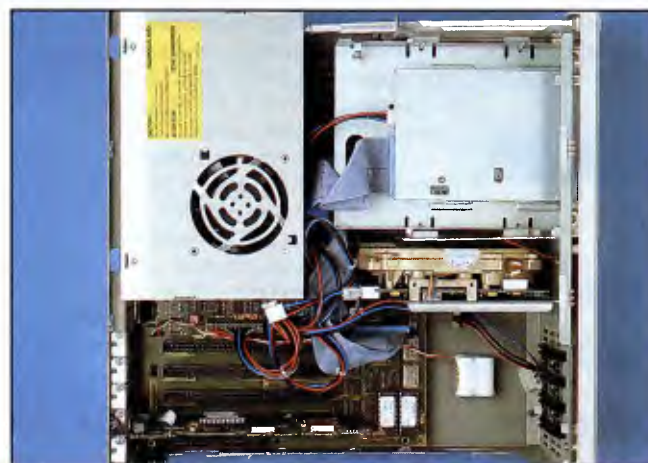
CPU	7.2
Memory	20.7
Disk	2.3
Video	5.5
APC index	6.6

Mexican item, and is light yet positive with a contoured key layout.

The main unit steel case is very easy to get into, with just two screws holding the lid in place. Much attention has been paid to screening on this model, with earthing contacts in at least four separate places on the lid. Once inside, the motherboard shows a high level of integration, with drive controllers and all ports onboard, and plenty of surface-mount components.

The in-built drive controller supports one hard and two floppy drives, and as supplied runs a 43M Miniscribe hard disk and a 3.5in 1.4M floppy. There is space for a 5.25in floppy under the existing drive.

The power supply covers nearly one third of the motherboard, and obscures a lot of componentry. The SIMM upgrade



The power supply on the Philips P3345 covers a substantial section of the motherboard and componentry

slots are similarly hidden under the floppy drives. This reduces the case dimensions, but restricts access.

The standard configuration is 1M of RAM — hardly enough for most users of 32-bit processing power.

The video board is curiously an add-in, not onboard. This is a Canadian offering (the Philips is a real global product!), and has both EGA and VGA ports, with an external selection dip switch. The latter is useful if making frequent monitor changes.

Other rear panel ports include two serial (one 9 and one 25-pin), a parallel port, keyboard and switched power. The use of one of each type of serial port underlines the confusion about which is now the standard on 386 machines, and the need for several adaptors.

A hint of European heritage can be seen in the manuals — in this case the colour of rotting Dutch cheese. The three tomes (DOS, operating and video board) are well prepared and informative at all levels, but have the most revolting cover design ever.

The Philips is an average performer, with a quality video display. It flagged no VGA errors, and had a well-balanced set of benchmarks. It is also very well built, and should last for years. Unfortunately, the machine is saddled with a high price tag. If it were \$1500 cheaper it would be a bargain, but as it is, other machines present better value.

Terran T30

Rather than simply screwdriver its boxes from Taiwanese parts, Terran, a relatively small Melbourne-based manufacturer, has designed its machines from scratch and manufactures many components itself.

This 'go-it-alone' approach is evident in both the appearance and construction of the T30, which owes little to the layout of the original IBM design, but still manages to be compatible. The T30 is more like the Apricot than the rest of the batch, despite using a standard AT bus, not MCA.

The combination extruded alloy and sheet steel case is easy to get into — simply undo two screws on the top panel.

Benchmarks

Terran T30

CPU	9.7
Memory	20.9
Disk	2.2
Video	5.8
APC index	7.1



The Terran T30 has a slim appearance

The overall profile is very slim, with a 3.5in disk drive and an indicator/switch panel being the only fittings on the front. Indicator lights show hard drive, network and power usage.

The T30 has what most washing machines and few PCs have — an electronic power switch. This arrangement is infinitely preferable to having mains wires draped across the interior of the box, and is backed up by a main isolator on the back panel. The back panel is pretty full of ports and sockets, with two serial, one parallel, video out, mouse and keyboard sockets all mounted directly to the motherboard, and an external floppy linked to it by ribbon cable.

Also on the motherboard are the video driver, hard and floppy drivers, and lots of chips specially blown by Terran, including its own BIOS chip. This high standard of integration allows the three horizontally-mounted AT slots to remain free for network or modem cards.

The memory upgrade slots for SIMMs are hidden under the 45M Fujitsu hard drive, but are accessible by undoing only four screws which allow complete hard and floppy removal on one sub-chassis. If you need another half-height drive, there is room under the standard floppy.

The monitor, a Teco TE 9513, does not have a tilt-and-swivel base, but gives a good steady display. It seemed to take a long time to warm up and occasionally had us checking for connection faults as a result. The simple contrast and brightness controls were adequate for most applications, but a mono/colour switch would have been useful.

The Terran showed more VGA BIOS errors (15) than any of the other machines, but this did not affect the software we ran. Special CAD drivers are supplied, so you can presume the more complex applications will run OK.

The one component found wanting in the T30 package was the keyboard. Made in Mexico, it seemed to respond only to earthquake-quality input — a gentle tap on the keys would be ignored. The layout was adequate.

The machine as supplied had DOS 4.01 on disk, plus original disks, but no DOS manual. It seems DOS manuals are no longer standard fare — few review machines included one. The operations manual was a basic yet informative booklet which gave instructions on how to use the Terran setup program and the boot password if required.

The benchmarks show the Terran's strong points to be fast CPU, memory ratings and mid-range price only offset by a poor disk rating. If Terran could improve the disk performance, the machine would be even better value, and home grown too.

Wearnes Boldline S 386SX

Wearnes is a Singapore-based company that makes a point of billing its total design approach as being superior to the 'add-in boards' method used by many Taiwanese manufacturers. This integrated approach extends to the appearance of the machine, with a coherent if somewhat lumpy look being common to both monitor and main unit. The latter features a smoked acrylic lid over the floppy access slot(s) which gives the box more the look of a piece of security equipment.

As supplied, the 386SX has a single 3.5in 1.4M floppy mounted vertically under the smoked flap, leaving two full-height drive slots free.

The front panel mounted power switch is recessed to avoid the possibility

Benchmarks

Wearnes Boldline S 386SX

CPU	6.7
Memory	20.3
Disk	2.0
Video	3.15
APC index	5.4



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The power switch on the Wearnes Boldline S 386SX is recessed to avoid accidental power-on



of accidental power ons, and is accompanied by power and hard disk lights. Only the Wearnes logo disturbs the otherwise plain grey front.

The monitor follows this colour scheme, with an unremittably plastic front panel. The big red switch, contrast and brightness controls are situated on the side panels.

The case is a sturdy steel affair, retained by four screws on the back panel. The rest of the back is uncluttered, with two 9-pin serial ports, one printer port and video and keyboard sockets. The six expansion slots are all available, blanked off on the left-hand side of the box. Once the lid has been removed, the internals are exposed as being fairly conventional. The only unique feature is the Wearnes proprietary upgrade slot for the Intel i486 expansion board at the front of the motherboard. There are five 16-bit and one 8-bit slots free, as all controllers and ports are motherboard mounted and driven. The onboard disk controller can handle one extra floppy and hard drive.

Four SIMM banks are provided to allow up to 5M of onboard RAM. They are easy to access, as is the 80387 coprocessor socket, but some of the jumpers are partially obscured by the cantilevered power supply.

The Western Digital hard disk is squeezed in by the side of the power supply, directly behind and in line with the 3.5in floppy. The hard disk came ready formatted, with DOS 3.3 onboard. The only manual supplied was a slim operation manual containing the basics needed to get up and running.

The hard disk was noisy, and rated poorly. The Coredisk speed rating was not appreciably worse than any of the other drives, so it is assumed the controller contributes to the lower benchmark. The CPU is a tiny 80386SX from Intel (as yet nobody else is licensed to produce them), with the support chips being a mixture of OKI and Texas Instruments. The majority of the other machines reviewed used either Intel or Chips and Technologies (C&T) NEAT chip sets.

This is possibly one reason why the Wearnes is bottom of the scale in CPU rating, as the integrated chip sets are obviously designed to perform better together.

Although monitor display quality was up to standard, the speed of the driver was not — the Wearnes was again bottom of the list. At the other end of the interaction chain, the keyboard was a functional unit with good tactile feedback and a slight keyclick. It rates within the top three.

Unfortunately, the rest of the machine was not as good. In terms of performance, the Wearnes was the slowest of the group in all benchmarks but one. Perhaps Wearnes' integrated design approach needs reviewing to keep up with the competition.

Conclusion

As with any review, establishing which of the machines reviewed is the best is almost impossible, as it ultimately depends on what you want.

Perhaps a more realistic approach would be to put together the ideal box from parts of each machine reviewed. The mutant machine would probably have a Philips monitor, driven by the

Microscience's VGAWonder card using shadow BIOS RAM from the Alpha.

It would have Apricot's casing, with a Terran power switch and BIOS, Microbyte's eight output ports and an Ipex disk and controller. It would interface through the AGI keyboard, and come with Microscience's bus mouse thrown in. And the price would be that of the Alpha.

But in the real world, every race has to have a winner, and in this case the Alpha has the most plus points. It is the cheapest, rates second in the benchmarks and seems to have good backup too. Second place is really a tie between the Terran and the Microscience — as long as the latter can solve the pre-release problems before shipping quantities. Both are quick and provide good value in 'bang for bucks' terms.

Next in line would be the Ipex, which returned a good score from a well-balanced benchmark, and has the upgrade facility too. The Apricot would probably be nearer the top of the pile if it wasn't for its cost — over twice that of the Alpha. However, it looks good, has a solid reputation and returned a very good score.

The Philips and the Cleveland tied on benchmarks, but the quality of the Philips offsets the price of the Cleveland to bring them about equal. Indeed, choosing between those two and the AGI or Microbyte is hard; price and backup would probably be the major factors here.

Last in the benchmarks, but third cheapest, is the Wearnes. It too has an upgrade path, but in present trim is probably not much more powerful than a fast 286, so make sure it will do what you want. In the end, you have to decide which machine suits your purpose, but the Alpha gets our vote.

END



Making DOS work overtime

Brian Carr reviews four environments that help you use your 386 to get the kind of multi-tasking capabilities that users of OS/2 and Unix enjoy, and the best part is you can do it without abandoning DOS.

Everyone seems to be talking about multi-tasking operating environments, but if you haven't used one of these systems, you may wonder what the commotion is all about. The answer is the dramatic productivity increase that multi-tasking can provide.

If you're like most people, you get sidetracked from a task to handle someone's request for information. With DOS, your PC can actually be an impediment when dealing with these interruptions, since you have to spend time gracefully exiting your present application and entering a new one in order to answer the question.

In this evaluation, we focus on multi-tasking DOS environments that allow you to run several DOS applications simultaneously. They allow you to switch from one DOS application to another in a fraction of second, and they even let you continue using your PC to compose a memo or look up a phone number while the PC performs a lengthy request, such as a spreadsheet recalculation or bulletin board download, in the background and out of sight.

The time savings may seem insignificant, but the increase in productivity is impressive. DOS users will become fans of multi-tasking DOS environments when they see how the PC can assist their thinking process rather than delay it.

Review criteria

In this article we review environments that extend DOS to run multiple DOS applications on 386 machines. We've excluded multi-user systems such as Digital Research's Concurrent DOS 386 and The Software Link's PC-MOS/386 since their forte is multi-user manipulation. Multi-tasking is just a small part of their story, and the overhead required to support multiple users would make the comparison unfair. We've also excluded full-





fledged operating systems that don't involve DOS, like Unix and OS/2. Four environments are evaluated here: DESQview 386, Microsoft Windows 3.0, Omniview 386 and VM/386 MultiTasker. If your PC is not 386-based, there's no need to feel left out. Most of these environments will run on other PCs, but with far less functionality.

DESQview 386 and Omniview 386 each have versions that run quite reasonably on XT or AT-class machines. They provide most of the functionality described here, with some restrictions on what applications can run in the background (not visible on the screen). Also, memory constraints will greatly restrict your ability to multi-task if you don't have a 386 or significant expanded memory (memory above the first 256K should be bank selectable via EMS LIM 4.0 or EEMS).

Windows 3.0 will theoretically run on an XT-class machine, but performance will probably be less than acceptable. In Windows, you have the ability to run multiple DOS applications only if you have a 386 machine.

The trouble with DOS

DOS restricts applications to the so-called low memory of 640K. This limits the functionality of each application since it has to fit all of its code and data into that 640K. Multi-tasking DOS environments utilise many megabytes of extended memory so you can have multiple applications, but they are each limited in function by the 640K of memory. Expanded memory, DOS extenders, VCPI and DPML (see the text box 'DOS extenders to the rescue') are already resolving this problem as they change the limits on DOS applications by making up to 16M of high memory (above 640K) addressable. OS/2 and new Windows-specific applications do not have this limitation.

A more serious problem is the single-tasking nature of DOS itself. The DOS file system is a critical part of all these multi-tasking DOS environments and has no awareness of other tasks. This makes it difficult to know when DOS has started a disk I/O and when it is okay to have the CPU work on another problem. Only VM/386 has worked out a good solution and it is more complex than if DOS were designed for multi-tasking.

DOS's single-tasking nature also requires the serialisation (or queuing) of requests to DOS so that DOS will only be working on one request at a time. Not only does this require system overhead, but it exposes the system to crashes. DOS applications intrinsically have direct access to DOS (DOS resides in their address

Editor's choice**DESQview 386 VM/386 MultiTasker**

VM/386 MultiTasker is the strongest multi-tasker for power users who want to tailor their system to precise specifications in order to run several applications simultaneously. You'll want to proceed with caution, however. VM/386 is fairly difficult to use.

You should consider DESQview 386 and Omniview 386 if you don't do much work with graphics and just want straight DOS-application multi-tasking. DESQview 386 offers more features such as text windowing, cut-and-paste capabilities and keyboard macros. If you don't need all that, turn to Omniview 386, which earns an honorable mention for its low cost, speed and ease of use.

You should consider Windows 3.0 if you do a lot of graphics work, want to start using the highly touted graphical user interface, or if your applications are intended to run under Microsoft Windows. As a multi-tasking operating system, Windows has adequate performance, but its user interface is the most polished of the environments evaluated. In other words, you can do better than Windows if your goal is simply to multi-task. What makes Windows 3.0 so good is its interface, not its multi-tasking.

space) and most of the reliability problems of these environments can be attributed to this accessibility and the difficulty of serialising in such an open environment.

Slices of time

In order to run multiple DOS applications simultaneously, a multi-tasking environment simulates having several PCs on hand by giving the CPU to each active task for a brief period and then moving on to the next task. This brief period is called a time slice. The system uses timer interrupts to initiate the switch between applications.

The manner in which the system allocates the CPU to the different applications is of great personal interest to each user, and there is no one correct way. The benchmark test results show the default division between the foreground task (the application visible on the screen) and the background tasks. Within each review we discuss the degree to which you can configure this division to your own preferences.

More ways to juggle tasks

There are many ways to move from one application to another in DOS without using a 386 multi-tasking environment like the ones evaluated here.

The simplest way is to learn how to use the common function of shelling out to DOS. In this procedure, you give a special command to your application telling it to stop what it's doing and dump you out to the DOS prompt. (In Lotus 1-2-3, for example, the command is /System.) When you are finished, you type something like 'Exit' and go back to the application right where you left off.

The problem with shelling out to DOS is that the first application usually remains in memory so that you have very little

memory left to do other things. You can exit your spreadsheet, but with two programs vying for limited 640K resources available to DOS, there isn't enough memory left to bring up your database.

Another approach is to use TSR (terminate-and-stay-resident) utilities like Borland's SideKick for some of your most frequent tasks. The problem here is that TSRs can lead to RAM cram, taking up valuable space in 640K RAM where all your TSRs and applications reside. TSRs tend to cause memory problems and offer only limited functionality. You can look up a phone number, but can't do a full database search.

Task switchers such as SoftLogic Solutions' well-known Software Carousel allow you to swap the current application out in a matter of seconds and bring in another full application. You can move quickly from task to task, but you can't use your PC for another task while waiting on a lengthy request like a database search. With task switchers, you can load several applications at once, but those in the background are frozen. So you get the look of multi-tasking without the power. Task switching is one way users of 286-based machines can simulate the feel of true 386-based multi-tasking without the 386 hardware.

And then there's Unix, the multi-user, multi-tasking operating system that dominates the high-end workstation market, yet hasn't made a significant migration onto the PC platform. Based on CPUs with the large address spaces essential to multi-user and multi-tasking abilities, Unix could not run effectively on DOS machines until the 386 machine entered the scene. This made it possible to run DOS virtual machines in a Unix environment. Hoping to capture DOS users who might move to OS/2, Sun Microsystems developed the 386-based Unix workstation offering another multi-tasking alternative.

Built into OS/2

OS/2 is another alternative to multi-tasking DOS environments. It has built-in

DOS extenders to the rescue

There is a variety of DOS applications designed to take advantage of the large flat-address space capabilities of the 386 processor. These applications rely on built-in DOS extenders that take the 386 into protected mode. Borland's Paradox 386 database package is a good example.

Originally, all of these DOS extenders were incompatible with any program that took the 386 into protect mode. The Virtual Control Program Interface (VCPI), initiated by Quarterdeck and Pharlap and finalised in June 1989, provides a way for such programs to obtain the required flat-address space without interfering with other protected-mode programs. VCPI allows environments such as DESQview 386 and Omniview 386 to support Paradox 386 and other applications that require the large flat-address space.

The chief drawback of the VCPI is that it provides no protection between applications. There is nothing to prevent any application from crashing the system — DESQview 386, for example, might do it. For these reasons, VM/386 and Windows do not support the VCPI.

The DOS Protected Mode Interface (DPMI), initiated by Microsoft with contributions from other industry players, is intended to provide a way for these applications to get the large flat-address space without crashing the system if one application fails. This interface is supported by Windows 3.0, although it has not yet been finalised. Therefore, Windows supports version 0.9 with the first formal version expected to be 1.0.

Over time, all 386-specific DOS applications should be adapted to run with all 386 DOS multi-tasking environments through some combination of VCPI and DPMI. But for now you should check to ensure that your 386-specific applications are compatible with the multi-tasking environment you choose.

Brian Carr

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A decision guide for multi-tasking solutions

The number of available multi-tasking options depends on the kind of micro-processor you are currently using. Although the 286 is adequate for some multi-tasking, only the 386 has the power to create virtual machines through virtual 8086 mode. Keep these definitions in mind as you make your decision:

- Task switching offers the look of multi-tasking without the power. Several applications can be loaded at one time, but those in the background are not active.
- A multi-tasking system is a single-user solution for actively running several applications simultaneously on one PC.
- Application isolation prevents other active tasks from crashing if one task crashes. Individual virtual machines can be rebooted.

multi-tasking capabilities, but currently does not run more than one DOS application at a time. It does, however, resolve many of the weaknesses of multi-tasking DOS environments; weaknesses that originate with DOS itself.

OS/2 resolves these problems by migrating the DOS file system into a multi-tasking environment. You gain the immediate benefits of concurrent CPU processing while disk I/O is being completed, and the result is a more robust and reliable system. The drawback is that until OS/2 Release 2.0 arrives, OS/2 will support only one DOS application at a time. However, you can run multiple OS/2-specific applications.

Windows 3.0 has its own set of Windows-specific applications with the same types of advantages and disadvantages, but with the limitations of the DOS file system — the Achilles' heel of Windows.

Replacing all your existing DOS applications with OS/2 or Windows-specific applications is obviously a radical step no-one is prepared to take all at once right now, but it's clear that over time, DOS will gradually be replaced with systems designed for large address spaces and multi-tasking. These four products give you a taste of that future today.

DESQview 386

Originally released in mid 1985, Quarterdeck's DESQview 2.2 was one of the first environments to run multiple DOS applications. Since that time, this \$325 program has been significantly expanded and remains a long-term market leader with about a million and a half users. You can buy DESQview-specific programs called DESQview Companions for \$150 each. These include notepad, calculator, calendar and communications programs, similar to the set of accessories included with Microsoft Windows 3.0.

DESQview 386 is actually a combination of two separate products: DESQview, the general-purpose DOS multi-tasker that runs on any PC-compatible machine; and QEMM-386, an extended memory manager for the 386 that's a useful tool even without DESQview. QEMM-386 converts extended memory into enhanced expanded memory by simulating EMS LIM 4.0 or EEMS memory with 386 extended memory. This frees up address space for DOS programs by moving resident routines and buffers above 640K. QEMM-386 saves you the cost of special memory boards that let your application programs access this high memory.

Cut and paste

With DESQview you can mark text in one window (the logical display for one application) and transfer the marked text to another application. If you master this cut-and-paste capability, you have a very convenient way to move information

from one application to another. The exchange is quite limited compared with data exchanges that are possible between Windows-specific applications such as Aldus PageMaker and Microsoft Excel, but will work with almost any application you'll want to use.

DESQview also offers keyboard macros that allow you to assign sequences of keystrokes to a single key that the environment memorises in a learn mode. The macro and learn capabilities are especially useful since they work the same way for all your applications.

The keyboard macros can even be integrated with the cut-and-paste capabilities of the DESQview program. With these tools you can, for example, write a macro to automatically initiate a search in your database, transfer the results to your spreadsheet, and transfer the updated spreadsheet results into a table in your word processor.

Capabilities blossom

DESQview features standard pull-down text-only menus; future releases of DESQview are expected to venture into graphical interfaces and X Windows. DESQview works with a mouse, though using one is hardly necessary. The en-

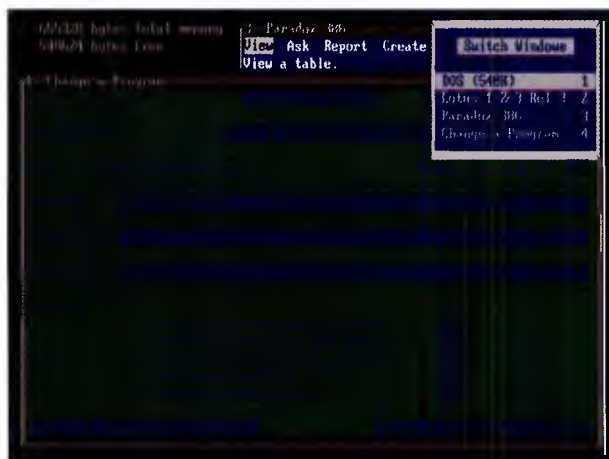
At a glance

DESQview 386, version 2.2

- Distributor:** Sourceware
Telephone: (02) 427 7999
Price: \$325
Requires: 0 to 130K of RAM; DOS 2.1 or later
In short: DESQview 386 is the environment to buy if you want efficient multi-tasking of DOS applications, text windowing, cut-and-paste capabilities and keyboard macros.

DESQview 386 provides text windowing of application screens.

The upper-right pop-up menu is used to select sessions. The lower part of the screen is the Change Program window, used here to describe the multi-tasking benchmark program



vironment has always offered text windowing, but with the advent of the 386, this capability has really blossomed, allowing you to window multiple ill-behaved applications — applications that write to the display directly — and graphical applications. The default hotkey to exit an active DOS session is the Alt key, though the hotkey definition is configurable.

DESQview 386 comes with three manuals, and considering the number of DESQview users, it's surprising that Quarterdeck has not developed a consolidated manual. The smallest manual contains the basic information you need

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to install and use the system. The main manual describes the basic features and functions of DESQview. It is well organised as a tutorial and can be very helpful for learning DESQview features. The third describes QEMM-386 in detail. You would probably not need this manual at all except as a reference manual in the event that you encounter some incompatibilities or wish to further fine-tune the system.

Intelligent installation

The clean and simple installation procedure for DESQview analyses your hardware and software automatically and doesn't trouble you with any unnecessary questions. The screens are well designed and apprise you of the progress of the installation. The installation procedure intelligently alters your CONFIG.SYS and AUTOEXEC.BAT and saves the original files under other names.

There is an optional step of running the Optimise program, a truly impressive tool to maximise the memory available to DOS applications. It runs flawlessly once invoked, though it can be disconcerting on first use as it reboots the machine twice and is all automatic.

Performance anomaly

DESQview 386 was one of the better performers in the environments evaluated here. However, disk performance was not particularly impressive. Other than Omniview and DESQview 386, all of the tested systems included a disk cache (and we tested the systems in their default configurations). If you add an external disk cache to DESQview 386, the disk performance should be one of the best.

DESQview 386 maintained reasonably consistent performance in the foreground with the exception of the DOS File Access (long records) test. This anomaly occurs because DESQview 386

breaks up long file requests into multiple requests so that other tasks are not starved unreasonably from access to the CPU while the request is processed. This slows disk access dramatically.

DESQview 386 allows you to adjust the time slices — the number of timer interrupts before the CPU is taken from the active task and given to the next task — only for foreground and background tasks. You have little latitude in specifying preferences or priorities on a per application basis. Windows and Omniview offer more latitude in configuration with respect to time slicing.

DESQview 386 is the proper environment to purchase if you are looking for efficient multi-tasking of DOS applications, text windowing, cut-and-paste capabilities and keyboard macros. It has a substantial user base and can significantly increase your overall productivity while relying on your existing DOS applications.

Microsoft Windows

At \$245, Microsoft Windows 3.0 is a real bargain when you consider all the functionality it offers. It includes a disk cache along with several useful applications, such as a note writer, calendar program and asynchronous communications program.

Windows has been available to users (though initially without multi-tasking) since the final quarter in 1985 and is estimated to have two and a half million users. Windows is, of course, a graphical environment, and while it can multi-task DOS applications gracefully, that is hardly its primary focus.

Refined GUI

The graphical user interface (GUI) of Microsoft Windows 3.0 is very carefully thought out and provides a substantial improvement over previous releases. With variably spaced fonts, buttons

shaded to appear 3-D, and improved colour usage, Windows 3.0 conveys an image of refined quality.

When you use Windows 3.0 without a mouse, the thoughtfully laid out user interface is transformed into a series of puzzles. Once you are in your DOS session, all keystrokes go to the DOS application with the exception of the two hot-key combinations of Ctrl-Esc and Alt-Esc. These combinations exit the DOS session and bring you back into normal mode. These hotkeys are adequately documented in the manual.

To use Windows 3.0, you need only know the basics of using a mouse, but to master this very large and complex system takes time. The 621-page manual that ships with Windows 3.0 examines complexities that the interface hides from the user.

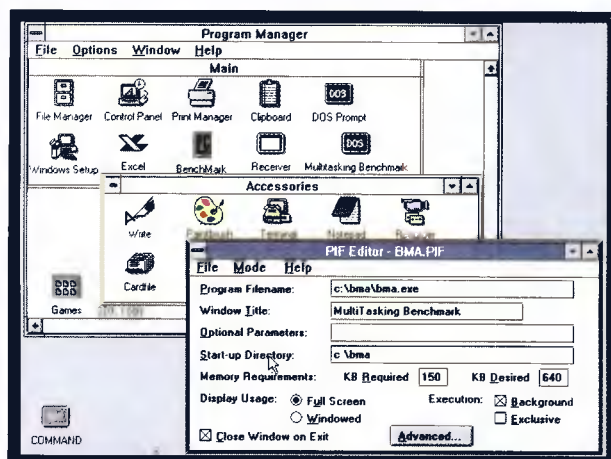
The state-of-the-art installation procedure contains extensive logic in order to determine the hardware it's running on and automatically configures the system while asking you a minimal number of questions. A graphical display of the percentage complete keeps you informed of the current status of the in-

At a glance

Microsoft Windows, version 3.0

Distributor: Microsoft
Telephone: (02) 452 0288
Price: \$245
Requires: 640K of RAM (2M for 386 enhanced mode); DOS 3.3 or later
In short: Microsoft Windows 3.0 has acceptable performance and a highly-refined graphical user interface. If you do a lot of work with graphics or want to start using a GUI, Windows 3.0 is the right environment for you.

Microsoft Windows 3.0 normally runs a VGA display in graphics mode. The lower-right window shows the PIF Editor accessory used to configure the multi-tasking benchmark program so it could run in the background



stallation. At your option, the install program can update your CONFIG.SYS and AUTO-EXEC.BAT. The overall effect is one of refined quality, which is sure to leave new users with a very positive first impression.

Unexpected results

In such a large and complex environment, it's not surprising that there are a few ways to hang the system. Certain combinations of normally acceptable operations cause unexpected results and may cause the system to cease working.

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this review, Windows 3.0 is the system most prone to such failures, a drawback that should improve with later releases of the program. However, the frequency of these problems is not great enough to prevent the system from being useful to most users.

If you run it in its enhanced mode (the normal mode on a 386 machine), Windows 3.0 utilises the 386 page tables to write inactive memory out to disk, making the system appear to have more memory than it really does.

There is an extensive list of Windows-specific applications from Microsoft and dozens of other vendors that will perform most standard PC operations like spreadsheets, word processing and desktop publishing.

If you take the step to convert to these Windows applications you will benefit from a consistent user interface across all your applications and have convenient integration between applications supporting the Dynamic Data Exchange (DDE) API.

Energy drain

Windows' performance as a multi-tasking

DOS environment is adequate. It doesn't rank first on all the tests because energy is used for functionality far beyond just running DOS applications simultaneously. This is important to keep in mind.

Equipped with a disk cache program called SmartDrv.Sys, Windows has the best overall disk performance. This disk cache made use of available extended memory (up to 2M) and was utilised during the benchmark testing. When the disk cache was not loaded or when extended memory was not available (as on the 386SX test system with only 2M of memory), Windows had the worst disk performance.

Omniview and DESQview allow the addition of disk caches and would have performed better with a disk cache. However, externally added disk caches cannot dynamically adjust the amount of memory used in conjunction with the memory taken up by the environment as Windows and SmartDrv.Sys do.

Time slicing

Windows maintained reasonably consistent performance in the foreground.

That is, the visible application did not change significantly depending on what the background task was doing. Further, Windows allows you to specify both the foreground and background priority of each application. With this priority you can specify the precedence given to the foreground and relative percentages of the CPU given to each active task.

Windows has problems with asynchronous communications programs and programs with unusual hardware dependencies. Since Windows does not support VCPI (see the text box 'DOS extenders to the rescue'), don't expect 386-specific software, such as Paradox 386, to run on it. As DPMS is accepted, the problem with 386-specific applications should be relieved, but for now caution is advised.

Windows 3.0 adequately runs multiple DOS applications. The chief attraction is its highly-refined graphical user interface (GUI). If you already have Windows applications, do a lot of graphical work, or just want to start using the widely discussed GUI, Windows is a great buy.

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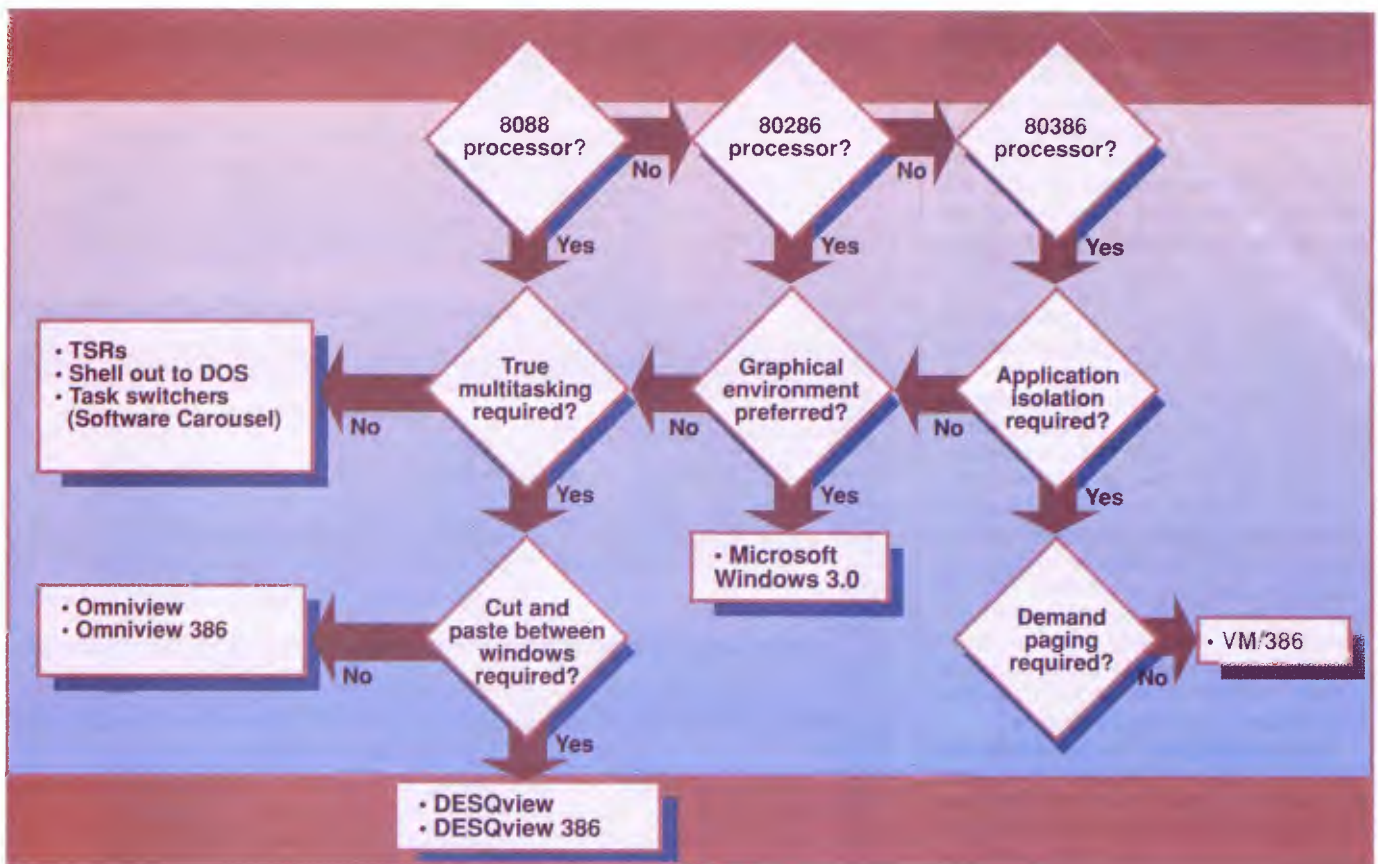
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386 multi-tasking environments: summary of features

Products listed in ascending price order

	Microsoft Windows 3.0	Omniview 386	DESOview 386	VM/386 MultiTasker
Price	\$245	\$255	\$325	\$350
RAM required for four 640K DOS sessions	2M	3M	2.5M	4M
Runs on network	●	●	●	●
Runs on MCA machines	●	●	●	●
Supports Super VGA	●	●	●	○
Interface	Pull-down menus, icons	Pull-down menus, character-based	Pop-up menus, character-based	Character-based
Text windowing capability	●	○	●	○
Maximum number of text windows	Unlimited	N/A	50	N/A
Graphics windowing capability	●	○	●	○
Maximum number of graphics windows	Unlimited	N/A	60	N/A
Can window any DOS application	●	○	●	○
Can communicate between tasks	●	●	●	●
Can file-share between tasks	●	●	●	●
Provides LIM EMS 4.0 driver	●	●	●	●
Supports VCP1 for applications	○	●	●	○
Supports DPMI for applications	○	○	○	○
Supports demand paging	●	●	○	○
Maximum number of concurrent sessions	Unlimited	10	50	16
Can reboot individual virtual machines	○	○	●	●
Print spooler available	●	●	○	○
Prints from multiple sessions simultaneously:				
To the same printer	●	○	○	●
To separate printers	●	●	○	●
Allows user-customisable time slicing	●	●	●	●
Allows user-customisable prioritisation	●	●	●	●
Customisable hotkeys	○	●	●	●
Allows simultaneous DOS use	●	●	●	●
Runs DOS and OS/2 concurrently	●	●	○	○
Allows standard DOS commands	●	●	●	●
Replaces standard DOS commands	○	●	○	○
Online help	●	○	●	●
Context-sensitive help	○	●	●	●
Tutorial provided	○	○	●	●
Free technical support	●	●	● (90 days)	● (90 days)
● — Yes ○ — No				
N/A — Not applicable: the product does not have this feature				



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Omniview 386

Omniview 386, version 4.2, is the essence of multi-tasking DOS environments. It doesn't have fancy windowing or complex device allocations; just fast and simple application juggling. At \$255, it is also one of the least expensive of the environments evaluated in this review, and the price includes the extended-memory manager 386-Mate. For non-386 systems, you can buy Omniview for \$182 and get the same multi-tasking environment without 386-Mate.

386-Mate is a useful tool even without Omniview. It simulates EMS LIM 4.0 or EEMS memory with 386 extended memory and can free up address space for DOS programs by moving resident routines above 640K. 386-Mate is not as capable as QEMM-386 (included with DESQview 386) to move buffers and TSR routines above 640K, but it is quite functional. Omniview 386 also includes several general purpose utilities such as Wheres, which searches for described files beyond the current directory.

The combination of Omniview and 386-Mate was only released in Australia last month. Current users of Omniview can upgrade to Omniview 386, but exact pricing has not yet been set. Omniview has a long history of working with other extended-memory managers such as Qualitas's 386Max. If you already have an EMM and want to save a few dollars you might check into buying Omniview by itself.

Interface choice

The user interface for Omniview 386 has full-screen menus where you select the desired entry via characters or cursor

At a glance

Omniview 386, version 4.2

Distributor: Microway

Telephone: (03) 555 4544

Price: \$255

Requires: 256K of RAM; DOS 2.0 to 3.x

In short: If you want simple, fast, easy-to-use and inexpensive multi-tasking of DOS applications, Omniview 386 may be the answer for you. It doesn't offer fancy windowing, keyboard macros or complex device allocation, but it does offer the best overall performance and a low price.

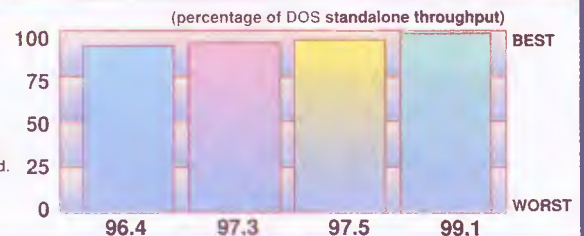
BENCHMARK TESTS: 386 MULTI-TASKING ENVIRONMENT

If you want to set up virtual machines on your 386 system or run processor-intensive tasks in the background, DESQview 386 is the environment for you. But Omniview 386 scores the best when disk access is most important.

PROCESSOR-INTENSIVE TESTS

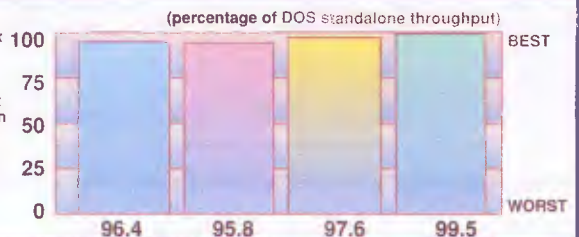
8086 Instruction Mix (three active background tasks)

The 8086 instruction Mix test simulates a CPU-intensive DOS application in which no system calls or I/O occur. The test is run as three simultaneous tasks in the background, while a fourth test is run in the foreground.



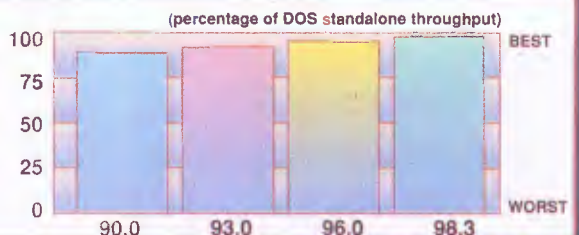
8086 Instruction Mix (one active background task)

For the 8086 Instruction Mix (one active background task), the same CPU-intensive test is repeated, this time with just one test running as a task in the background and two background sessions waiting for keyboard input.



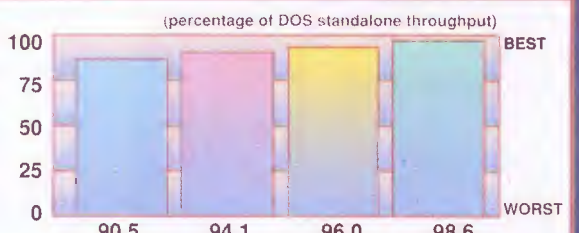
8086 Instruction Mix (SX machine with three active background tasks)

For the 8086 Instruction Mix (SX machine with three background tasks active), the same CPU-intensive test is repeated, this time on a 16MHz 386SX machine with three background tasks active.



8086 Instruction Mix (SX machine with one active background task)

For the 8086 Instruction Mix (SX machine with one background task active), the same CPU-intensive test is repeated, this time on a 16MHz 386SX machine with one test running as a task in the background and two background sessions waiting for keyboard input.



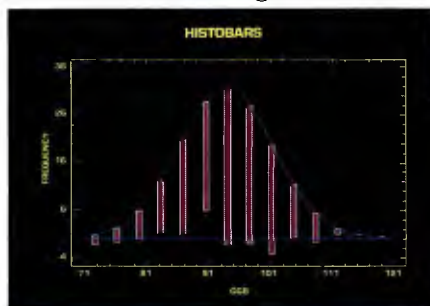
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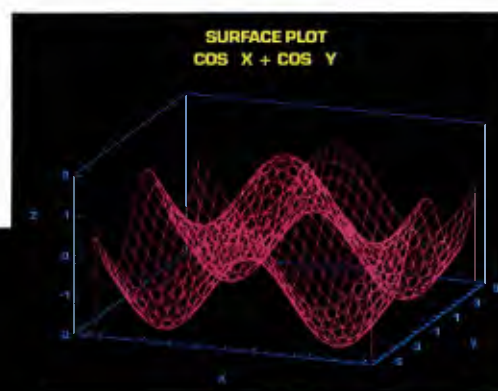
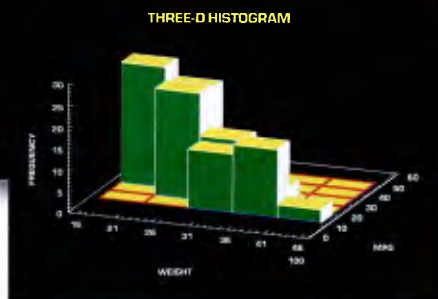
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How we tested

Measuring the speed of multi-tasking environments is difficult because the performance of one task depends on all the other active tasks at any given moment. To measure these differences, we developed a new testing routine to run the standard benchmark tests as several separate tasks simultaneously, but synchronised through a shared file so that any combination of tests could be run at the same time.

With this tool we were able to measure what happens when the 8086 Instruction Mix was run in one, two, three or four simultaneous sessions, simulating simultaneous CPU-intensive DOS applications. We report the total system throughput as a percentage of how DOS performs these tests standalone.

All of the multi-tasking environments allow you to adjust the percentage of the CPU given to a task either by prioritising your tasks or by changing the number of time slices (clock ticks) for each open application. (We tested with default set-ups wherever possible.) We also report significant variations in the percentage of CPU power given to the foreground task.

Since all of the multi-tasking environments allow all active tasks to share a hard disk, the environment must serialise (queue up) disk requests so they don't in-

terfere with each other. We ran tests to measure the effects of this serialisation on performance.

Along with the large and small-record DOS File Access tests, we included an ultrashort-record file access test that writes 32,768 bytes to a file, one byte at a time. This single-byte file I/O happens often in applications such as DOS's COMMAND.COM when it executes a batch file. The test emphasises the performance hit introduced by sharing the hard disk.

The display and keyboard must be shared among the tasks in the same way, but in these cases, the environments provide logical devices to each application and map the logical devices onto the real display and keyboard when appropriate. We ran the Video Direct to Screen test on the logical displays and report the effect on system throughput of the virtual display as compared with the throughput of DOS alone.

Test environment

Most of the tests were run on a Compaq Deskpro 386/25 with 4M of RAM, a 60M hard disk and a VGA adaptor. To measure performance degradation with an increasing number of background tasks on a slower system, we also tested with a

16MHz 386SX machine with 2M of RAM, a 40M hard disk and a VGA adaptor. All of the environments were set up in their default configurations, with the following exceptions:

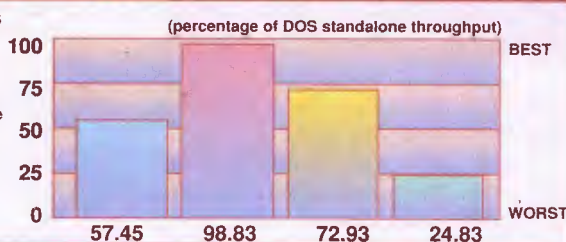
- In VM/386 MultiTasker, the Shared Resource Manager (SRM) disables inactive tasks when it detects that a task has entered a keyboard wait loop. However, a CPU-intensive task looks like a task in a wait loop to the SRM. We increased the SRM time-out value to 12 seconds so that each task could complete the CPU test before being timed out. We also put in an extra test sequence after a task went into a keyboard wait state to allow time for the SRM to recognise that the task should no longer be given the full share of the CPU.
- For Microsoft Windows 3.0, we created a Program Information File (PIF), which noted that the test application should be permitted to run in the background.
- DESQview 386 was tested with the 'Virtualised Text/Graphics' option turned on to eliminate bleed-through of background screen writes and cursor positioning. Had this option been turned off, DESQview 386's video performance would have improved markedly.

BENCHMARK TESTS: 386 MULTI-TASKING ENVIRONMENT

PROCESSOR-INTENSIVE TESTS

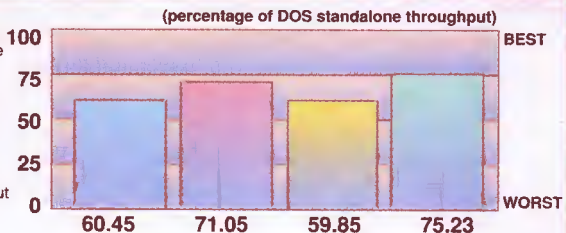
8086 Instruction Mix/DOS File Access (foreground)

The 8086 Instruction Mix/DOS File Access test runs the DOS File Access test as a task in the foreground and the 8086 Instruction Mix in the background. Two background sessions are open but inactive and waiting for keyboard input. This test measures the throughput of the foreground task, and is reported as a percentage of DOS's throughput performing the same task by itself.



8086 Instruction Mix/DOS File Access (background)

The 8086 Instruction Mix/DOS File Access test runs the DOS File Access test as a task in the background and the 8086 Instruction Mix in the foreground. Two background sessions are open but inactive and waiting for keyboard input. This test measures the throughput of the foreground task, and is reported as a percentage of DOS's throughput performing the same task by itself.



Microsoft Windows 3.0
VM/386 MultiTasker
Omniview 386
DESQview 386

movement keys. You select the desired DOS session by pressing Ctrl-Shift and the number of the session. Session number one is the system menu used to create new sessions.

You can also run Omniview 386 without the menu system, which saves memory and lets you execute the equivalent functions from the command-line interface. While this probably won't appeal to most users, the combination of command-line functions and the system menus is most appealing.

It allows you to maintain one or more DOS sessions for running miscellaneous applications and update the system description as you run different applications. For example, you might have a session in which you normally run background compiles but occasionally want to run your favourite asynchronous communications program to download files.

Without command-line functions you would need a separate session that requires special treatment for asynchronous communications. With command-line functions you could write a batch file that would set up the appropriate parameters before loading the program and restore them on termination.

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DESQview/X: a cross-standard standard

Take a close look at the screen dump in Fig 1. Notice the Lotus 1-2-3 screen, the Borland Turbo C++ window, the Unix command line session, the DOS command line session and the application manager ready to start a mixture of DOS and Unix applications? It looks like its all running on an X Window desktop, but it could just as easily be running on a PC.

Sparced (sic) your interest? There are a whole bunch of people who really want to do this sort of thing — they're running Unix, but want to also use applications that are only available under DOS, or they're running DOS and vice versa.

The product that works this magic is DESQview/X. In a nutshell, DESQview/X is the normal DESQview multi-tasker complimented by an X Server terminal emulator, Window manager and DOS-to-X translation software. But perhaps a little more explanation is in order.

X marks the spot

First of all, what is X? X is a collection of standards from the Open Software people, originally developed at MIT in 1984. At its lowest level, X defines a communications protocol for sending graphic commands between computers and terminals. Moreover, X is event driven and lending itself to GUI applications; and instead of computers and terminals, we have clients and servers.

The X Window system does not define a GUI interface. Instead, it is the bricks and mortar through which a GUI environment, or Window Manager, would be built. The Window Manager takes care of placing the windows on the screen, moving them, redrawing them, and putting them away. Application programs (clients) are responsible for what goes in the windows, and either use the X protocol themselves to laboriously draw the content of the window, or use toolkit calls for generating standard features like buttons and boxes.

As usual in Unix, options abound. The Window Manager might be OSF/Motif, Open Look or Tab. The toolkit might be Athena, OSF/Motif, Xol, Xview or XVT. Because all of these environments generate standard X Protocol calls, they can be intermixed. The toolkit used when a program was written determines how

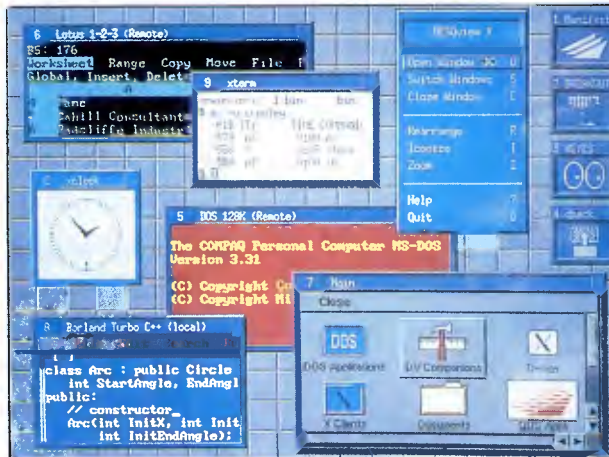


Fig 1 A DESQview/X system with the DESQview Window Manager. Some applications are labelled remote or local for illustration purposes only, though a user's implementation of this system may elect not to show this kind of information

things look within the window, while the Window Manager active when the program is running determines how the border of the window looks and what sort of window manipulation can take place.

As the X Protocol is primarily a communications protocol, there is a great deal of flexibility regarding what happens where. In particular, one given X Terminal may contain windows connected to multiple different X Clients on multiple computers.

The DESQview connection

Using the multi-tasking foundation of DESQview, Quarterdeck is proposing to run an X Server (screen handler) in one partition, and use the X Protocol as the internal communications mechanism between other tasks and the outside display, as shown in Fig 2.

At first sight, this seems a strange thing to do — why use a standard Unix protocol inside a DOS machine? After all, where would one find a DOS application program that makes X Windows calls instead of DOS calls? But it becomes clearer as we go on.

As shown in Fig 2, applications specifically written to be X Clients under DOS (of which there are none currently) can be run directly and use the internal X Protocol to display their windows. Conventional DOS applications need some special handling, but DESQview already does special handling for these applications anyway. In order to keep their output within a conventional DESQview text window, Quarterdeck uses virtual 8086

mode, shadow screens, application loaders, and all sorts of tricks to make standard out-of-the-box programs like 1-2-3 display their screens elsewhere than on the display. Once their output has been redirected, DESQview can happily take the portions it wants from each of the applications and display them on the physical display. The only difference under DESQview/X is that the X Protocol would be used to send desired portions to the physical display. All the difficult bits remain exactly as they are today.

With this dynamic translation facility, DESQview/X becomes capable of running standard DOS character mode applications in X Windows. This is pretty much the same as running standard DOS character mode applications in Microsoft Windows, except a lot less desirable on the face of it. Quarterdeck claims that DESQview/X will even be able to run DOS GUI applications in a window, although these won't be dynamically translated to X calls for performance reasons.

Of course, there are lots of limitations surrounding this whole arrangement, but a 286-class machine should do the job. For full functionality, a 386 or 486-class machine should be used. Again, just like Microsoft Windows. The only real catch is that DOS Extended applications that run in graphics mode cannot be windowed under DESQview/X at all — they must be run full-screen.

The architectural advantage

The real power of this arrangement, and

Mostly self-explanatory

Omniview 386 comes with a 156-page manual that includes critical information about switching between sessions. Once you know about the Ctrl-Shift number combination, the rest of the

system is self-explanatory. Otherwise, the manual is a well-organised reference, containing a generous section on setting up and running a large set of common applications with all the suggested options.

The installation procedure does not

automatically update your CONFIG.SYS or AUTOEXEC.BAT. Instead, it provides easy access to the READ.ME file, which explains the required changes. It can also put you into an editor to edit those files directly, but it is easier to edit the READ.ME file before starting the installa-

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DESQview/X: a cross-standard standard

indeed its whole reason for being, is the communications aspect of X. Imagine it as a Windows program making Windows calls, but with a communications pipe between the program making the calls and the copy of Windows accepting them.

With a network layer involved, Clients (programs) can be located anywhere on the network and still be displayed on your screen. In a DOS network, that could prove useful, but hardly exciting.

The good bit comes in Fig 3, where the network spans a variety of machine types and we have total 'mix-and-match' freedom of what runs where and what is displayed where. Imagine a Unix machine or network with existing users. Simply by adding a DOS box running DESQview/X, all users would have access to DOS applications presented in a familiar way on their familiar X desktop — even if those applications are GEM programs or non-GUI programs.

Similarly, a DOS network could be given a TCP/IP connection to a Unix box, and have the ability to run Unix X Window applications from their PCs. If connected to a Unix network, they could run applications from a variety of Unix machines, their own DOS programs, and programs that actually execute in other machines on the DOS network.

That is why the screen in Fig 1 could just as easily be a PC or an X Terminal.

Indeed, for all of the above flexibility, the only restriction is that the PC or PCs in question must be running DESQview/X.

Rounding it off

X Window Managers tend to be fairly large beasts. OSF/Motif is 650K, which is a mouthful for a 1M machine. Xol's Open Look is 1.5M. Although it is possible to run these Window Managers (parts of them, actually) under DESQview/X, Quarterdeck acknowledges that the memory cost may be too high, and therefore provides its own manager — DWM. DWM provides the obligatory 3-D sculptured look, but its main feature is a memory price tag of only 50K.

The only piece that really seems to be missing is some form of file system conversion. While a user can happily sit with Unix and DOS applications running in windows before them, or multiple ap-

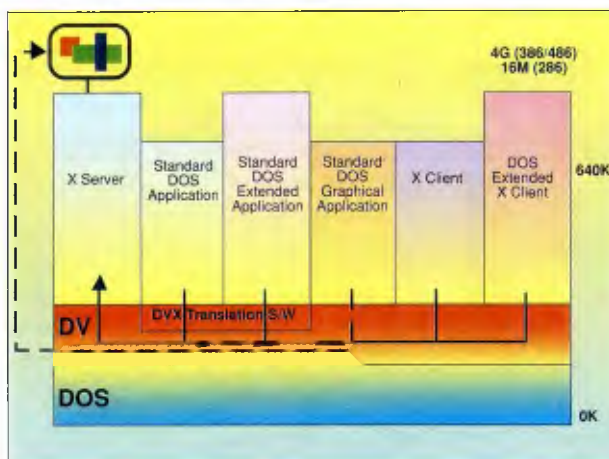


Fig 2 The general structure of a standalone DESQview/X system

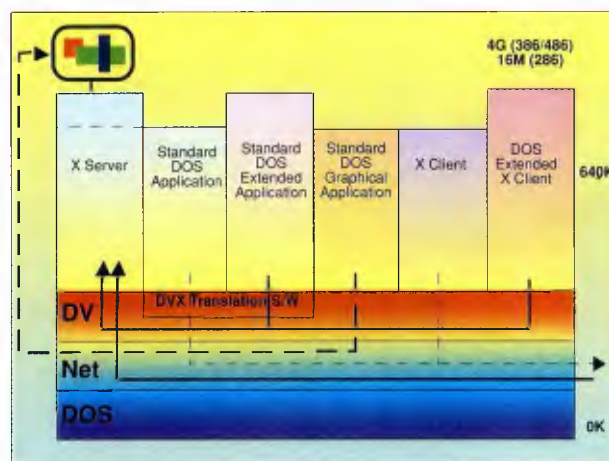


Fig 3 An example of one instance of a multivendor network with DESQview/X machines

plications from machines scattered to the four winds, you cannot expect to save a file from one application and open it in another unless the two applications run on the same machine, same network, or networks with file system bridges. Nevertheless, what you can do is still pretty neat.

The big picture

How does all this fit in with Microsoft Windows and OS/2? Well, it doesn't really.

My second thought when I saw Windows 3.0 was that DESQview was out of a job — not entirely, but certainly for the sort of usage most users make of it. Evidently, Quarterdeck had much the same thought, as it has neatly stepped outside the Windows vs OS/2 ring.

In some ways, Quarterdeck is out of a

race that it was going to lose anyway; in other ways, it has rejoined the same race on a horse that is charging down the same track, but starting at the other end. By backing X Windows, Quarterdeck finds itself with the backing of the whole OSF consortium and all those bunch players eager to see Unix cemented in place as a standard. There is an extensive congregation of zealots for whom Microsoft Windows is some sort of evil greasy kids stuff, but literally froth at the mouth with enthusiasm for X.

But more important than the current GUI skirmish, Quarterdeck promises that DESQview/X will, in the first quarter of next year, effectively do tricks that neither OS/2 nor Windows will be able to do for a very long time to come.

Ian Davies

tion procedure, and then make changes with your favourite text editor.

Omniview 386 supports the VCPI (see the text box 'DOS extenders to the rescue') and a very large set of applications. As with DESQview 386, Omniview 386 provides very little

protection from faulty applications. However, if you are like most people, you regularly use a relatively small set of applications. Once you've learned how to set up those applications, the system will run flawlessly without any protection.

If you are trying out a new application, particularly one that accesses hardware directly, you should save files to prepare for a system crash. Having experimented for a while, you will know what precautions are necessary for that application.

From Network to homework

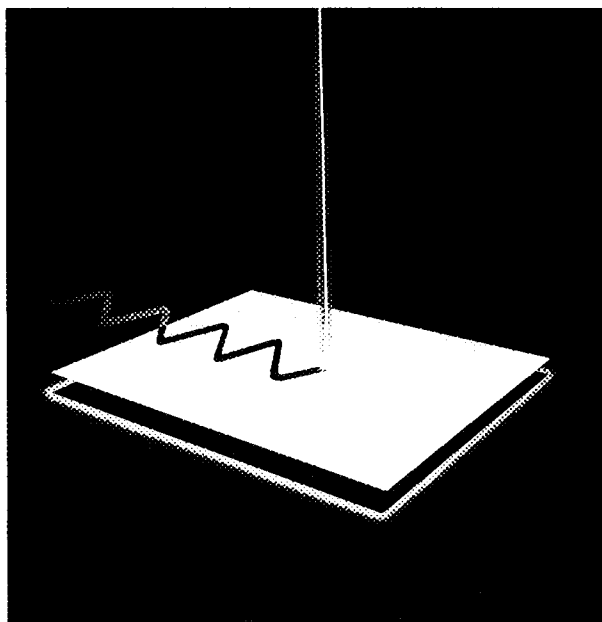
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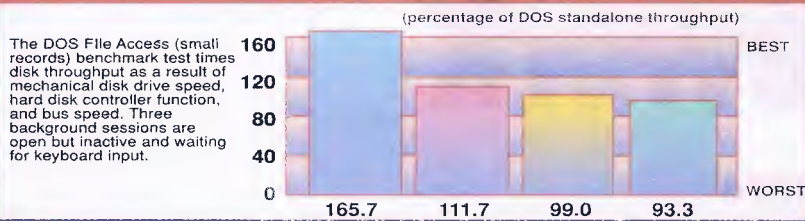
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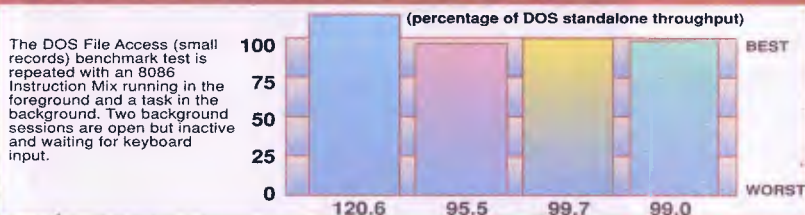
BENCHMARK TESTS: 386 MULTI-TASKING ENVIRONMENT

DISK-INTENSIVE TESTS

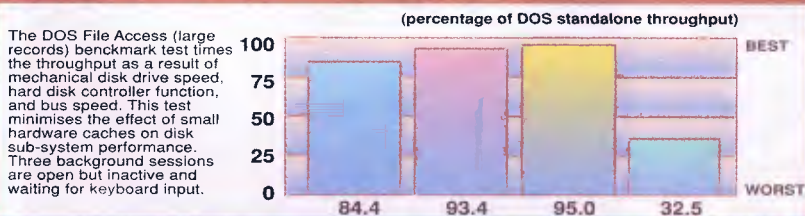
DOS File Access (small records – foreground)



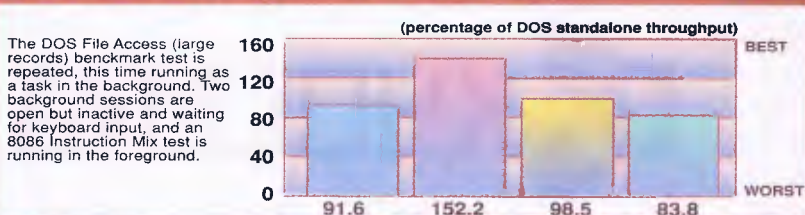
DOS File Access (small records – background)



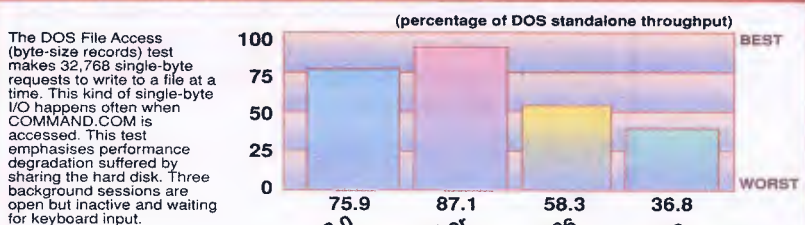
DOS File Access (large records – foreground)



DOS File Access (large records – background)



DOS File Access (byte-size records – foreground)



Microsoft Windows 3.0
VM/386 MultiTasker
Omniview 386
DESQview 386

Best overall

Omniview 386 had the best overall performance of the tested environments. Windows, which includes a disk cache, did better on the disk access benchmark tests. Using Omniview 386 with a disk cache program of your choice is recommended. With the addition of a disk cache, Omniview 386 should provide the best overall disk performance as well.

Omniview 386 provides excellent flexibility in configuring your priorities. You can specify both priorities and time-slice lengths. The priorities are not absolute; the system will continue to give time to lower priority tasks, only at much reduced levels. The consistency of foreground performance on the benchmark tests for Omniview 386 is quite impressive.

Omniview 386 is excellent value. It provides fast and simple multi-tasking of DOS applications without a lot of extras. It has one of the lowest prices of the reviewed systems and the best overall performance.

VM/386 MultiTasker

IGC designed VM/386 MultiTasker, version 1.22, to take full advantage of 386 systems. First released at the end of 1987, bearing a price tag of \$350, VM/386 is somewhat of a newcomer to the multi-tasking environment field, but has established itself in the marketplace by focusing on high-end 386 systems and demanding users.

The primary user interface in VM/386 is a series of full-screen menus from which you select an entry with either the cursor keys or character input.

The hotkey for VM/386 is the SysReq key, which on most current keyboards is a two-key combination. The manual refers to both SysReq and Alt-SysReq. This can be most confusing, since both combinations are possible on the original AT keyboards. The SysReq key gets you out of the selected DOS session and back into the menu screens. The hotkey is easily identified because you are required to press SysReq to get out of the initial system menus into a DOS session. The system menus will remind you of this.

Some of the critical functions, such as assigning a device to a DOS session, can also be issued as commands in the session (VMLINK in this case) as well as through the usual menu interface.

VM/386 comes with a 269-page manual that's well organised as a reference, though a novice may be intimidated by the depth of information. A second manual, the *Installation Guide*, covers many of the same topics and func-

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tions primarily as a technical update for the original manual.

The installation procedure for VM/386 is a relatively simple batch file that copies the required files to the hard disk. Rather than make any changes to your CONFIG.SYS or AUTOEXEC.BAT files, it refers you to the manual and a READ.ME file for the changes you must make in order for VM/386 to work. There cannot be any device drivers that take the 386 into protected mode.

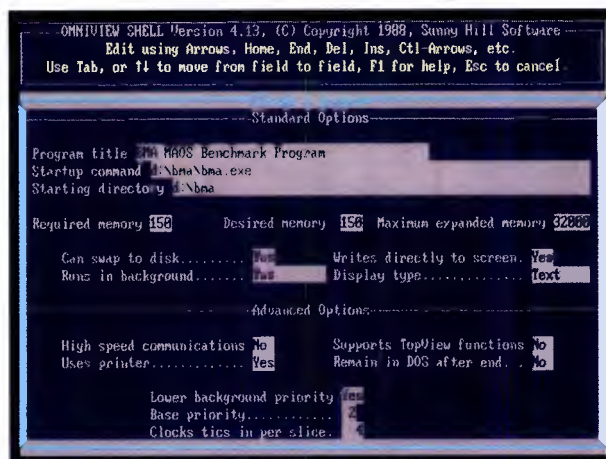
The Achilles heel

Of the tested packages, VM/386 is the only environment that prevents each application from interfering with any other application or the system. We call this application isolation. If an application crashes, you can reboot that DOS session by pressing Ctrl-Alt-Del.

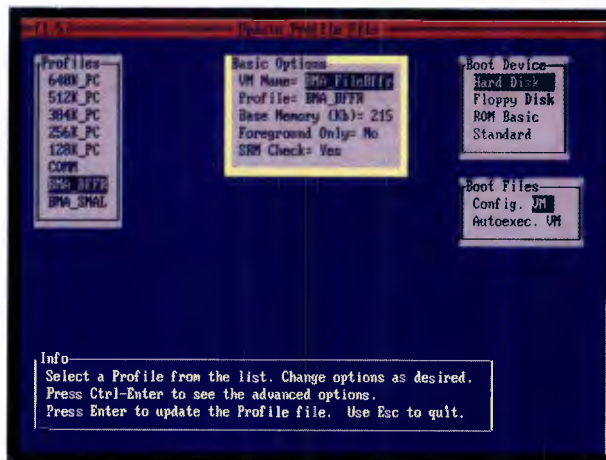
However, the Achilles heel of this feature is that the applications share the hard disk. If the application was in DOS when it crashed or when you pressed Ctrl-Alt-Del, there is a good chance that the entire system will be hung so that no other part of the system will be allowed access to DOS.

The conscientious isolation of the DOS sessions can also lead to some difficulties with the keyboard state. When you go back to a session, it may think the Alt key is depressed as it was when you left the session after pressing Alt-SysReq to get to the system menus. Keys will not work as you expect until you press and release the appropriate key (Ctrl, Shift or Alt). When this has been done, the session will be notified that the key has been released.

VM/386 does not support demand paging or swapping of applications to



Omniview 386 provides full-screen text menus and has no windowing capabilities. The screen shown is used to describe the multi-tasking benchmark test for Omniview



VM/386 displays full-screen menus with yellow to highlight the active sub-menu. This screen shows the profile used to describe the multi-tasking benchmark session with just enough memory for the file buffers

disk, and uses a lot of memory for each session. Not only is there a separate copy of DOS in each session (decreasing the useful area for the application), but there is also about 40K of system buffers per session. On a 4M system this will hardly be noticeable, but on the 386SX test

system with only 2M of RAM, running four copies of the bench-mark test, was challenging. Demand paging is planned for the next release of VM/386 and should eliminate many of the memory problems, although performance may be degraded.

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Understandable performance

Overall, VM/386 has below-average performance. This is understandable since the environment takes a significant performance hit on overhead to provide application isolation.

VM/386 performed very well when one task required significant disk activity while another task demanded more CPU-intensive activity. It recognised when the disk task was waiting on disk I/O and gave the CPU to the other task, allowing a 50 per cent increase in total system throughput. No other environment took advantage of the ability to utilise each part of the system fully.

Time slicing

VM/386 has very intelligent dispatching algorithms that give the CPU to each application at regular intervals so that screen updates occur smoothly. However, almost no preference is given to the foreground application.

VM/386 does not directly detect when an application goes into BIOS to wait for keyboard input. Instead, it relies on its Shared Resource Manager to detect such situations. This means that there is a waiting period for keyboard input during which VM/386 will still give the task regular time slices. The opposite side of this problem is that CPU-intensive applications (such as a spreadsheet recalculation in memory) may stop receiving regular time slices. Both these problems required special attention in our testing procedures.

An additional method of detecting keyboard wait states is planned for the

At a glance

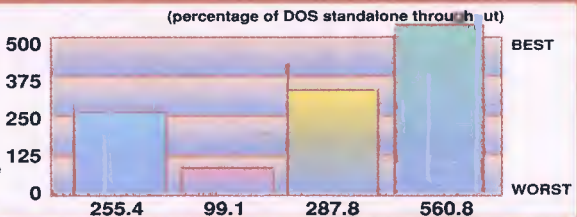
CM/386 MultiTasker, version 1.22

Distributor: Micro Data Management Systems
Telephone: (02) 745 1677
Price: \$350
Requires: 2M of RAM (3M recommended); DOS 3.0 to 4.01
In short: An excellent tool for the computer professional who has the time and interest to completely control his system. VM/386 can handle errant software and disparate special-purpose devices. However, caution is advised for those with SCSI controllers and 386-specific applications software.

BENCHMARK TESTS: 386 MULTI-TASKING ENVIRONMENT

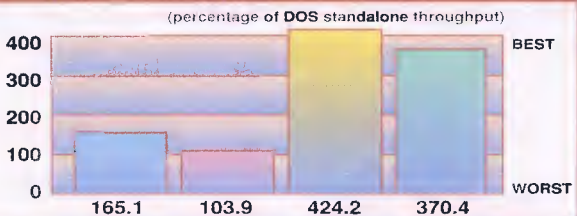
Video BIOS Routine With Scrolling

The Video BIOS Routine With Scrolling test measures how fast the video adaptor can scroll the screen, moving the display up one line at a time. Good performance is helpful for scrolling through word processing or spreadsheet files. Three background sessions are open but inactive and waiting for keyboard input.



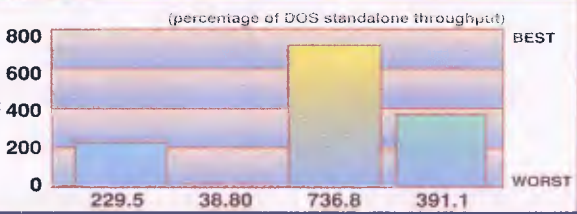
Video Direct to DOS (foreground)

The Video Direct to DOS benchmark test measures the time it takes to write 240 lines of text one line at a time to a full screen. The test runs in the foreground while three background sessions are inactive and waiting for keyboard input.



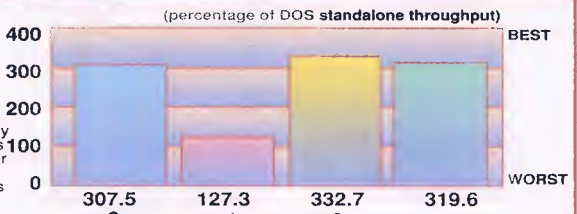
Video Direct to DOS (background)

The Video Direct to DOS benchmark test is repeated. This time, the foreground session and two background sessions are inactive and waiting for input, while the test runs in the background.



Video Direct to Screen

The Video Direct to Screen benchmark test indicates the speed of the video adaptor memory. Good scores indicate that information can get to the screen quickly, particularly for programs that avoid the computer's BIOS and go directly to the screen. The test is run as a task in background. Two other background sessions are waiting for keyboard input, as is the foreground.



next release of VM/386. It should eliminate the problems with the Shared Resource Manager.

Before buying VM/386 you should ensure that your hardware is supported. Bootable SCSI controllers (with drivers in ROM) are supported by copying in a special driver. SCSI controllers that require device drivers in your CONFIG.SYS can only be accessed by a single DOS session unless you buy the NetPack option for \$225. VM/386 also has problems with more than two disk drives on a system and with the IBM external 5.25in floppy disk drive.

Since VM/386 does not support VCPI, don't expect most 386-specific software,

such as Paradox 386, to run on it. As DPMI gains acceptance, this problem may be alleviated, but for now caution is recommended.

VM/386 is an ideal environment for the power user who has the time to take charge of the 386 system. It has all the controls required to configure the system to your specifications. It also provides very good application isolation, making it a robust system suitable for use as a process controller or special-purpose device controller. It is not for the casual user who wants a little extra functionality beyond that of DOS.

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Migration patterns

The software industry has never abandoned its quest for the silver bullet — a methodology or philosophy that with one shot would eliminate the problems endemic to software. Past candidates have included structured languages, structured analysis and design, fourth-generation languages and AI. But software continues to be expensive and problematic. The latest candidate for the role of silver bullet is object-oriented programming (OOP).

Many people have rather naive views of the OOP terrain, tending to fall into one of two schools of thought. The first is the 'OOP is magic fairy dust' camp, which holds that OOP will make programming go away and reusable components appear, like alchemists' gold, from the unwieldy libraries that preceded them. The second is the 'OOP is old wine in new bottles' camp, merely the latest round of marketing hype from an evil coterie of language vendors. While the latter view is more conservative and less prone to disaster, neither permits its adherents a chance to realise the real potential of OOP. A more realistic view of OOP proceeds from the following:

- OOP does have benefits, but they are not free.
- A commitment to OOP and reusable software requires significant organisational support.
- Object-oriented techniques can and should be considered separate from object-oriented languages.
- Organisations can minimise risk and turbulence by taking a staged approach in migrating to object-oriented technology.

Benefits package

Object-oriented technology improves software systems because it facilitates better factoring of functionality and related data than do traditional structured-programming techniques. Using object-oriented

Moving to object-oriented technology is more complicated than simply buying a compiler. Chuck Duff and Bob Howard explain what's involved.

techniques does not imply better design; you can easily find many bad procedural designs dressed up in object-oriented clothing. Rather, OOP languages add features that allow the efficient implementation of well-factored, minimally coupled systems.

In this sense, object-oriented technology is in step with many well-established principles of good software design. For example, Myers's Composite Structured Design promotes high module cohesion and low module coupling as broad benchmarks for system quality. OOP promotes high cohesion through inheritance and polymorphism, allowing more general, finer-grained code. It promotes loose coupling via encapsulation and dynamic binding, which insulate data and procedures from the rest of the system.

These characteristics improve the long-term life and maintainability of object-oriented systems for the same reasons that they are considered advantageous in relation to structured programming: systems that localise information and logic are simply less complex.

There is no magic here, and no radical departure from accepted software wisdom. OOP is the next step in the evolution of structured programming.

Building highly reusable software components is a difficult undertaking. OOP improves code reuse by using less complex, loosely coupled, highly cohesive components. Even so, most people tend to underestimate how difficult it is to produce such high-quality designs, regardless of how you do it. The job is much easier with OOP, but it is still a considerable challenge.

The ability to produce reusable components opens up a new set of opportunities and problems in software development. Ideally, reusable components would replace much original development activity. These components would come from within a project, a com-



pany or the world at large. This requires an archiving and repository technology and procedures that simply don't exist today.

Paying the piper

Any business decision about whether or not to adopt OOP must weigh the costs of climbing the learning curve: language, programming model, class library; incompatibilities between new and existing code; and the need to develop an organisational infrastructure to support software reuse.

Marketing lore to the contrary, adopting an OOP language without making other investments will not significantly improve either the maintainability or reusability of your code. In the hands of well-trained, properly organised project teams, however, OOP will almost certainly provide benefits.

Most new technologies require some degree of retraining. For OOP, the learning involves obvious issues, such as language syntax, and deeper issues concerning the programming model and class library. Syntactic differences between OOP languages and traditional procedural languages come about because OOP languages need to support the notion of sending requests or messages to objects to perform some action.

For example, in some OOP languages, such as Smalltalk and C++, the syntax places the receiver of the message first, followed by the message name. Other OOP languages, such as Actor, use the opposite order, more closely following procedural function calls. Programmers can usually absorb a new syntax fairly quickly.

A matter of time

Of far more significance than syntactic changes, however, are changes to the underlying programming models. These are more fundamental and thus more challenging. They affect analysis, design, coding and optimisation.

Good object-oriented designs tend to be much more modular and distributed than those targeted for procedural implementations. OOP languages work best with this kind of design, but programmers who are new to OOP and have not used inheritance and polymorphism before are not accustomed to building modular, reusable components.

A reusable component must be written in a very general manner. Since most programming languages do not allow truly general code, most programmers haven't developed these skills.

The most time-consuming part of the OOP learning curve involves learning

about the class libraries. These can include classes shipped by the language vendor, purchased from library vendors, or previously created by the project vendor. When you use object-oriented languages, the basic library may include several hundred classes. In the future, corporate and intercorporate object repositories may offer a selection of literally thousands of classes for reuse.

Hands-on instruction and intelligent code-browsing tools are the most effective ways of ensuring that programmers become familiar with the existing class

'In the future, corporate and intercorporate object repositories may offer a selection of thousands of classes for reuse.'

libraries. When browsing tools are not available, you increase the likelihood of wasting time reinventing classes that are already available.

Another cost of migrating to OOP may come from the need to replace systems or libraries incompatible with the new OOP language. This cost can be burdensome enough to change your mind about using the new technology. Happily, most modern OOP languages can interface with existing systems and libraries implemented in procedural languages.

Organising for OOP

There is a hidden cost that is sometimes overlooked as an organisation migrates to a new technology: people are afraid of and often resist, change. Programmers and technical people invest a tremendous amount of time and energy in developing their expertise. A radical change that may render their knowledge obsolete is often perceived as a threat. These feelings can have a definite effect on morale and productivity and, if not managed, add to the overall cost.

In many cases, this fear is due to a lack of understanding of how OOP works. You can greatly reduce these anxieties by showing that, given some knowledge of structured programming and design, OOP is an evolutionary rather than revolutionary step.

Much has been made of object orientation's ability to foster the creation

of reusable software components. Very little has been said about the cost of developing the methods and the corporate infrastructure to support this goal. All too many organisations have been lured by claims of instant reuse; unfortunately, it just isn't so.

Developing reusable components is easier in an OOP language, but not automatic. Organisations wishing to adopt these techniques must be prepared to change the development practices of project teams and the structure of systems development departments.

Within the project team, you can promote reuse by making several important tasks explicit. Time must be allocated to study existing classes to determine proper inheritance and reuse decisions. In our experience, project teams tend to work most efficiently when you separate the responsibility for building general-purpose components from the responsibility for reusing and customising those classes in an application.

Thus, you can divide the members of a project team into two groups: builders and reusers. Time should be set aside for interaction between them. This will result in better inheritance and reuse decisions by the reusers, and additional ideas for new classes by the builders. Interaction at this level is essential to ensure that code is reused and not rewritten. It also decreases the likelihood of creating very generic and reusable classes that fill no real applications development need.

Beyond support at the project level, it is essential to have a corporate or departmental awareness of code reuse and organisational structures that support this. A project team's focus on single-system requirements and stringent deadlines affords its members neither the viewpoint nor the time to engineer generally reusable components. If organisations want to realise large-scale reuse, they will need to form groups whose sole purpose is to build general-use classes and to manage the class repository as a corporate resource.

Transition matters

Although the benefits of OOP are significant, so are its costs. If badly managed, the transition can result in much wasted effort and reduced productivity. In many cases, we have found that a gradual, staged adoption of object-oriented technology allows an organisation to minimise these costs and, in the long run, take greater advantage of the benefits.

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Objects in C

In an object-oriented implementation in C, we will define the data and functionality of graphical objects. You can use C's **struct** data type to define an object. First, you create a general **shape** class, followed by descendant classes **line** and **rectangle**. Drawing these shapes requires two steps. The first involves setting up the object's display attributes (eg, colour, style and brush). The second step, which is not shown in the code, involves actually drawing the object.

Our first attempt at creating objects provides encapsulation, but no support for polymorphism or inheritance. We will add these facilities later. Thus, you can define a simple object type, such as **shape**, as consisting of two point objects: **origin** and **corner**.

```
typedef struct shape {
    POINT origin;
    POINT corner;
} SHAPE;
```

By placing the structure definition in a header file, **shape.h**, you can declare instances of the class in any module that includes it. Next, you need to define the class's behaviour and ensure that there is no access to internal data from outside these methods. A class file, **shape.c**, would begin with the header and would contain every function that can operate on a **shape** object. Note that in your first implementation of the **shape** class, you need to hard-code the differences in the drawing behaviour based on the object type. Thus, **line** objects will call the function **setLineTools** and **rectangle** objects will call the function **setRectTools**.

```
include <shape.h>
```

```
/* Define methods for drawing and
inverting shape objects. Illustrates the use
of encapsulation. No support for polymorphism
or inheritance. */
```

```
void draw(self, display, type)
void *self;
SCREEN *display;
int type;
```

```
{
    if visible(self)
    {
        if type == LINE
            setLineTools(self, display);
        else
            if type == RECT
                setRectTools(self, display);
            else
                error("invalid shape");
                drawShape(display, self);
    }
}
```

The parameter **self** represents the object to be drawn. The encapsulation provided by the class structure and functions lets you write fairly clean code, although it still has a distinctly procedural flavour. By adding support for polymorphism via messages, we will eliminate this code later.

SHAPE class's first descendant is **LINE**. The definition of a **LINE** structure includes the ancestral structure **SHAPE**. This construct simulates the inheritance of instance variables, but it is not automatic. A structure that defines the **PEN** class completes the definition.

```
typedef struct line {
    SHAPE shape;
    PEN pen;
} LINE;
```

The routine **line.c** begins with the definition of class structures, listed in inheritance order. You follow this, once again, with the associated functions. Then you implement the function **setLineTools**, which will be called from the generic **draw** function.

```
include <shape.h>
include <line.h>

void setLineTools(self, display)
void *self;
SCREEN *display;
{
    setPen(display, self->pen);
}
```

RECTANGLE class is implemented in the same fashion: first, the class definition

in **rect.h**, and then the **include** statements and function definitions in **rect.c**.

```
typedef struct rect {
    SHAPE shape;
    PEN pen;
    BRUSH brush;
} RECTANGLE;

include <shape.h>
include <rect.h>

void setRectTools(self, display)
void *self;
SCREEN *display;
{
    setPen(display, self->pen);
    setBrush(display, self->brush);
}
```

Notice the difference in behaviour between **setLineTools** and **setRectTools**. Since an instance of **LINE** owns a **PEN** but no **BRUSH**, it sets only a single tool in the display. **RECTANGLE** instances need to set a **BRUSH**, as well.

This difference in behaviour is handled by having the general **draw** function in class **shape** check the type of the object before making the appropriate function calls. However, the behaviour is far from automatic. In particular, if you add additional shapes later, you will need to update the generalised **draw** function. This may actually increase the likelihood of coding errors.

In contrast, in a completely object-oriented language, the language translator automatically handles the need to dispatch different behaviours for different object types. This makes it easy to create polymorphic behaviour. In fact, you can simulate polymorphism with a messaging mechanism.

Supporting polymorphic messaging

To implement polymorphism, you need a mechanism that translates a general message into the address of a particular routine at run-time. This decision

structured methods or procedural-language applications, it is essential to maintain compatibility with the existing development cycle. Carrying along existing language technology is often a political necessity as well. Those who use Cobol, Fortran, C, Pascal and other traditional languages need not be excluded

from the move towards object orientation.

As an initial step, it can be useful to implement object-oriented techniques within a traditional language. This not only produces useful results, but it also helps many programmers understand the inner workings of OOP languages.

This kind of experience demystifies the technology and helps increase acceptance of OOP.

Simulating OOP

There are three important features that distinguish OOP languages from tradi-



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Objects in C

should be based on the object's type and, by inference, its ancestors. Implementing this feature provides several advantages that are difficult to achieve in traditional languages. Special cases are implemented in low-level classes, rather than growing monolithic blocks of code that show very little impact from code changes. As a result, coding, testing and debugging become considerably simpler.

Since polymorphism is based on late binding and procedural languages are early bound, you must create a lookup table of message IDs and corresponding addresses. This implementation is not particularly efficient, but it is easy to understand. First, you define a structure that includes a message ID and a pointer to a function. Arrays of these structures can be used to build each class's method table.

```
typedef struct meth {
    int messageID;
    void *methodFunc();
} METHOD_MAP;
```

Next, you need a structure with which to model classes. The array **methods** holds the table that translates messages into function calls for a single class.

```
typedef struct class {
    METHOD_MAP *methods[];
    char[32] name;
} CLASS;
```

In **shape.h**, you add a variable that points to a **CLASS** structure. When objects of this class receive messages, they use the **methods** array in their class structures to translate them into specific function calls.

```
typedef struct shape {
    CLASS *class;
    POINT origin;
    POINT corner;
} SHAPE;
```

Although the method tables for **LINE** and **RECTANGLE** classes both store entries for the **SET_TOOLS** message identifier,

the functions they refer to are different.

```
METHOD_MAP lineMethods[] = {
    {INVALIDATE, *invalidateLine()},
    {INVERT, *invertLine() },
    {CONTAINS, *lineContains() },
    {SET_TOOLS, *setLineTools() },
    ...
    {NULL, NULLPTR }
};
```

```
METHOD_MAP lineMethods[] = {
    {INVALIDATE, *invalidateRect()},
    {INVERT, *invertRect() },
    {CONTAINS, *rectContains() },
    {SET_TOOLS, *setRectTools() },
    ...
    {NULL, NULLPTR }
};
```

To complete the messaging scheme, you need a **sendMessage** function. This examines the receiver's **CLASS** structure to access the method table and execute the appropriate function.

```
void sendMessage(message,
    receiver, arg)
    int message;
    void *receiver;
    void *arg;
{
    int index;
    METHOD_MAP map;
    index = 0;
    do
    {
        map =
            receiver->class->methods[index];
        if message == map.messageID
            return (*map->methodFunc)
                (arg);
        ++index;
    }while (map.messageID != NULL);
}
```

You can now improve the **draw** method by taking advantage of polymorphism. Since both **LINE** and **RECTANGLE** objects have **SET_TOOLS** entries in their class's **methods** array, you can ignore the differences between them; they will be handled automatically. When members of each class receive **SET_TOOLS**, they respond with

behaviours appropriate to their type.

```
include <class.h>
include <shape.h>

void draw(self, display)
    void *self;
    SCREEN *display;
{
    if visible(self)
    {
        sendMessage(SET_TOOLS, self,
            &display);
        drawShape(display, self);
    }
}
```

Adding an inheritance scheme

The final aspect of object-oriented programming that you need to simulate is inheritance, the heart of developing reusable code. Inheritance enables you to design systems by refining codes. In the current simulation, you can most easily model this mechanism by simply extending polymorphic messaging. You can extend the definition of a **CLASS** struct to contain a pointer to the class's parent class.

```
typedef struct class {
    METHOD_MAP *methods[];
    class *ancestor;
    char[32] name;
} CLASS;
```

The **sendMessage** function can now be enhanced to search the parent class's method table if the target message is not found in the descendant class. This technique could be extended to allow a linked list of ancestors to implement multiple inheritance.

The techniques that have been illustrated — namely, simulating encapsulation, polymorphism and inheritance — can be implemented in a variety of different languages and go a long way towards explaining how OOP works. Most OOP languages actually use far more efficient hashing and message-caching techniques in place of the message lookup shown here.

tional programming languages: encapsulation, polymorphism and inheritance. To simulate OOP, you need to map each of these into suitable mechanisms in the procedural language.

Encapsulation is generally used to describe an object's protection of its private data from outside access. Strictly

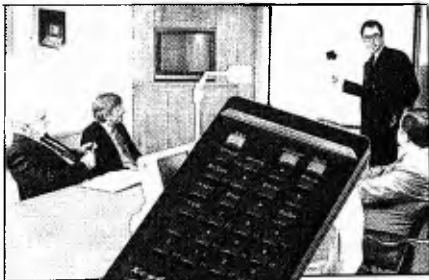
speaking, no object should be able to access another object's internal data. In a broader sense of the term, encapsulation also implies the ability to have objects that are bundled with data and code.

Polymorphism, the ability to have different kinds of objects respond to the same message in different ways, is based

on two techniques: generic operators and dynamic binding. Languages like C demand that each function has a unique name that is bound at compile-time to a known address.

OOP relies on being able to associate generic message names with one or many routines, known as methods. When

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Actors and their roles

In a completely object-oriented language, everything is an object, including fundamental entities such as numbers, strings and even code. Object-oriented constructs that C must simulate, such as classes and messaging, are part of the language definition, resulting in a much cleaner implementation of object-oriented code. Listing A shows how the example from the text box 'Objects in C' is implemented in Actor, as an object-oriented language.

In Listing A, the definition of the class is shown in comments, since the browser actually generates the code automatically. Several other things are worthy of note as well. First of all, the Actor language contains a class construct that carries with it the idea of protected scoping, instance variable, and method tables and inheritance.

When you define a new class using Actor, you need only specify its ancestor, and the compiler automatically associates the ancestor's methods and instance variables with the new class. You don't need to define a `class` instance variable, because the compiler places that information into every object when it is created.

You can think of the class field as an instance variable of class `Object`, a root class from which every Actor object automatically descends. You can also eliminate the manual declaration of an instance of the ancestor class in the descendant's instance-variable list.

Second, no types are assigned to the instance variables. Because all variables in Actor hold objects, every object 'knows' its own type or class. As a result, type declarations are unnecessary. They can still be useful for integrity validation, but the

```
/* Definitions for class Shape:
Ancestor: Object
Instance Variables: origin, corner
*/
Def draw(self, display)
{ if visible?(self)
then setTools(self, display);
drawShape(display, self);
endif;
}

/* Definitions for class Line:
Ancestor: Shape
Instance Variables: pen
*/
Def setTools(self, display)
{ setPen(display, pen);
}

/* Definitions for class Rect:
Ancestor: Shape
Instance Variables: pen, brush
*/
Def setTools(self, display)
{ setPen(display, pen);
setBrush(display, brush);
}
```

Listing A The ease with which you can implement object-oriented designs with an OOP language is merely an example of the concept that form follows function

language can function perfectly well without them.

A third point to observe is the lack of address operators. You never need to use address operators to reference or dereference pointers, because Actor transparently hides the implementation of objects through pointers. The language automatically dereferences pointers in those primitive methods that access an object's actual data. This issue

can have a major impact on productivity, because pointer errors are one of the most common and costly mistakes that C programmers make.

In addition, you will notice the absence of a `sendMessage` call. Every function call is a message sent in Actor, so you don't need two different syntaxes. The C form

```
sendMessage(SET_TOOLS, self,
&display)
```

maps into

```
setTools(self, display)
```

which is less complex and easier to read and avoids the use of an address operator. Furthermore, there is no need to have a `methods` table that maps a generic operator to a physical function. This is already part of the language itself.

The message dispatcher is written in assembly language based on a threaded-code compiler, similar to those found in Microsoft's QuickPascal and most Forth implementations. As a result, it runs much more efficiently than most high-level message simulations would.

Finally, you don't need to explicitly deallocate objects, because a concurrent garbage collector is constantly running, destroying objects that can no longer be referenced. In the C example, you would have to destroy objects at the appropriate time or risk overflowing the heap. This necessity introduces another class of nasty bugs related to destroying objects at inappropriate times, which is also known as the 'dangling pointer' problem.

an object receives a message, the language translator determines what action to take based on the object's class or type. This process is known as dynamic binding, since the address of the method that will execute is determined at run-time.

Inheritance denotes the ability of an object to derive its data and functionality automatically from another object. This is based on creating new classes of objects as descendants of existing ones. Most OOP languages, including Actor, Smalltalk, Objective-C and Object Pascal, allow only single-ancestor inheritance. Some languages, such as C++ and CLOS, allow multiple inheritance.

Writing simple object-oriented extensions to a procedural language like C is fairly easy; that's what some OOP languages, such as C++ and Objective-C, do. Of course, achieving fast performance of a commercial-quality translator and adding advanced

features such as automatic memory management is more challenging.

In C, you can represent a class as a source file that contains the class data definitions and their associated functions. This uses C's language-scoping facilities to hide the data structure's internal representation. Using Cobol, you might create a separately compiled sub-program, with data definition and associated code paragraphs.

To simulate the behaviour of classes, the object's data, known as 'instance variables', must be accessed only through its own methods. The text box 'Objects in C' details an object-oriented implementation in C.

The real thing

Although you might be tempted to view the simulation of OOP techniques in a

procedural language as proof that OOP is 'old wine in new bottles', there is a fundamental distinction between languages that allow OOP and those that actively encourage it.

Yes, it is possible to write OOP code in C by extending the language somewhat and enforcing coding standards and self-discipline. However, it remains much easier to do OOP in a language that requires no extra simulation overhead.

This probably accounts for the fact that many programmers who make the transition to hybrid OOP languages, such as C++, continue to write hard-to-reuse procedural code rather than take advantage of the reusability OOP offers.

In contrast, programmers who use completely object-oriented languages, such as Actor or Smalltalk, are much more likely to write reusable code. These languages and their tools encourage programming in an

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object-oriented fashion. It's worth comparing the implementation of the graphics classes in C with a completely object-oriented version in Actor (see the text box 'Actors and their roles').

Form follows function

The difference between the Actor listing and the C listing reflects the extent to which the conceptual model contained in a tool maps to the model used in the solution. C was designed to be a general-purpose, efficient, medium-level language for systems development. Thus, you can use it to solve virtually any problem — even to implement the basics of OOP.

Actor, on the other hand, was designed as an object-oriented applications development system. Its language efficiently supports encapsulation, polymorphism and inheritance, as well as a large class library, without requiring the programmer to be aware of the internal implementation mechanisms. You can achieve the same concepts in C or other procedural languages, but they require some syntactic baggage as well as additional coding effort.

OOP languages don't do anything

magical or impose good design, or make poor programmers into great ones. They simply let the form of an object-oriented implementation more accurately reflect its function. They do this by moving a lot of the syntax and control logic into the language kernel — code that would

'It is important to separate the tools from the techniques.'

otherwise have been necessary to simulate object-oriented features.

The journey's end

Far from being a solution to all problems, object-oriented technology introduces a whole new set of challenges into a development organisation — challenges that need to be dealt with sooner or later, anyway. These include crafting and archiving reusable components, estab-

lishing more consistent and panoramic approaches to system building across organisations and making a serious commitment to well-factored, high-quality designs.

While the realistic challenges might appear daunting, you can take them on incrementally. A staged approach to object-oriented technology can minimise anxiety by providing some safety ropes in the form of ties to existing knowledge. Object-oriented technology is much less daunting to someone who has made its concepts concrete by implementing them in a traditional language. Although what emerges might not be particularly beautiful or efficient, it is safe, useful and certainly instructive.

Such an intermediate step lets you undertake the move to true OOP with more confidence, because it exposes the true nature and benefit of object-oriented features. It is important to separate the tools from the techniques. Object-oriented technology gives you a powerful framework for understanding and expressing well-factored designs. OOP languages provide a clean and efficient implementation vehicle for realising those designs, no more and no less.

END



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Database wars revisited

When all the dust settled from the great database wars of the 1970s, Codd's 12 rules for a relational data model stood triumphant over the hierarchical and network database. In the 1980s, however, came a challenge called the *Object-Oriented Database Manifesto*, written by a gaggle of notable academics specialising in object-oriented technology. The relational camp's response — *Third Generation Database System Manifesto* — was not slow in coming. At stake, after all, were the hearts, minds and purchasing budgets of database designers and users everywhere.

Although you may have little taste for the theoretical debates of the experts, you do have an interest in the outcome. At issue is the question of the type of data repository that will best suit your needs in the coming decade.

The relational gospel

The *Third Generation Database System Manifesto*, authored by several database notables (Michael Stonebreaker, Larry Rowe, David Beech, Bruce Lindsay and others), attempts to replay this history of data management as nothing less than an evolution of information. These data elders decree that the 1970s was the era of the first generation (better known — or not known — as hierarchical databases); that the 1980s was the era of the second generation (better known as the relational database); and that the 1990s is the era of the third generation — which is, as yet, nameless but certainly just an

How do you decide which type of database is best when even the experts can't agree? Christopher Stone and David Hentchel shed some light on this perplexing problem.

extension of the relational model of the 1980s.

The third-generation database, as described by the manifesto, has three basic tenets to it.

1. It must accommodate a broader range of data types, such as images, multimedia documents, video and other 'objects'. It must also support 100 transactions per second, and support rule management for data integrity and business processes.
2. It must support all the 'good' features found in the second-generation (relational) databases, such as non-procedural access and data independence. The manifesto states that C++ based object databases will have to support SQL, thereby slowing down performance (to relational levels).
3. It must communicate and be interoperable with distributed DBMSs, C programs, business applications, Unix commands, software-engineering tools and so on. It must not be too tightly bound to a specific language.

You may have noticed that these relational aficionados made no mention of the 'OO' word. Thus, the battle lines are drawn. It's the self-proclaimed good guys (relational companies) against the self-proclaimed good guys (object-oriented companies), all hoping to get a chunk of your database dollars.

According to the third-generation manifestites, the entire evolution of data management is embodied in the three tenets outlined above, and the relational model will prevail in the marketplace. But this doesn't explain the presence



and notoriety of the object-database 'Huns', who are finding a sizable market for their products.

Look closely, and you'll see that this latest chapter in the database wars is not really a war at all. It's more like a bar fight — with lots of name-calling, missed punches and broken glass. No clear winners. To understand this battle, and to understand the benefits and liabilities of the two database models, you must first look at some of the historical background and facts in this area.

Database distinctions

There are very real and clear distinctions between an object-oriented database and a relational database. Object databases, in essence, use a navigational model of computation. This comes under intense scrutiny from the relational crowd, which claims that it is a 'back-to-the-future' technique from the world of hierarchical databases. Relational databases are based on a mathematical theory, while most object databases are not.

Relational databases were never really designed to allow for the nested structure and views of a design. Thus, the criticism launched at the object-oriented databases (OODBs) centres on the navigational aspect of 'nested' objects. The question is, how do you traverse complex structures (objects)? The advantage to navigation, especially when using large, complex applications such as those used in aerospace, CAD/CAE and so forth, is that it is easier and much more natural to weave your way through objects that model the real world rather than tables, tuples and records.

Facts on OODBs

OODBs are, in fact, quite similar to network or hierarchical databases. They follow a nested structure of objects, while hierarchical databases follow a manually navigated record structure. Both have the notion of 'pointers'.

In an OODB, object identifiers are logical pointers that are never reused. These object identifiers normally identify an object that is generated by the system. They verify the existence of the object and the 'class' to which the object belongs when the system attempts to send it messages. This lets OODBs attach methods to objects that can enforce arbitrary integrity rules.

Hierarchical databases guarantee integrity only for set structure and indexes. Relational databases enforce only index references, but developers have made it publicly known that they are working on more general integrity rules. The most

Relational vs object-oriented databases

How relational and object-oriented database vendors characterise their respective products gives you an idea of the types of problems these systems are designed to address.

Relational databases

- Structured query
- Minimise data dependency
- 'The way people really think'
- Slower than hierarchical
- ... but nobody cares
- Short transactions,
- optimistic concurrency
- Conforms to fourth-generation languages
- Implicit relationships
- No unique identifiers
- Can represent 'objects'

Object-oriented databases

- Navigational query
- Minimise procedure dependency
- 'The way people really think'
- May be slower than relational
- ... still, nobody cares
- Long transactions,
- gaining optimistic concurrency
- Conforms to object languages
- Explicit relationships
- Unique object identifiers
- Can represent 'relations'

glaring difference between OODBs and the hierarchical and relational models is that OODBs introduce an entirely new suite of concepts — concepts that include inheritance, class, method and messages.

OODBs let you include much of the code (methods) in the database itself. This incremental knowledge about the applications provides the ability to optimise query processing and to control the concurrent execution of transactions. OODBs are thus active, while relational databases are passive.

Get the job done

Performance is always a major issue in any system implementation. Particularly with information of high data complexity and multiple interrelationships, OODBs may prove to be better performers than relational databases. For example, an OODB could cache certain objects in storage or memory by anticipating what you may do next. In fact, the more complex the data, the more performance benefits you realise with an OODB. Clustering and caching techniques for certain complex nested structures in OODBs can give a data performance two orders of magnitude greater than that of relational databases.

The two major commercial applications for OODBs are the 'document' database and the distributed database. The first allows for rich data modelling constructs, inferencing and the storage of complex objects such as voice, video, vectors and graphical images. In addition, it supports lengthy interactions with the database that may take several days and multiple versions of the data. The document database should also be independent of a particular programming language to allow for data sharing at the object level among many different applications.

The second of the promising areas for

OODBs is client/server applications, where a centralised object server manages the persistent database on behalf of many clients. This can then be extended to include a fully distributed OODB, where objects are distributed across different physical sites completely transparent to the user.

Relational differences

It's hard to confuse a relational database with an object-oriented database. The normalised relational model is based on a fairly elegant mathematical theory. Relational databases derive a virtual structure at run-time based on values from sets of data stored in tables. Databases construct views of the data by selecting data from multiple tables and loading it into a single table. (OODBs traverse the data from object to object.)

Relational databases have a limited number of simple, built-in data types, such as integer and string, and a limited number of built-in operations that can handle these data types. You can create complex data types in a relational database, but you must do it on a linear basis, such as combining fields into records. And the operations on these new complex types are restricted, again, to those defined for the basic types (as opposed to arbitrary data types or 'subclassing' with inheritance as found in OODBs).

The object model supports 'browsing' of object class libraries, which allows the reuse, rather than the reinvention, of commonly used data elements. Objects in an OODB survive multiple sessions; they are persistent. If you delete an object stored in a relational database, other objects may be left with references to the deleted one and may now be incorrect. The integrity of the data thus becomes suspect and creates inconsistent versions.

In the relational database, complex

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TSRs remain fully functional	✓		✓
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objects must be broken up and stored in separate tables. This can only be done in a sequential procedure with the next retrieval relying on the outcome of the previous. The relational database does not understand a global request and thus cannot optimise multiple requests. OODBs can issue a single message (request) that contains multiple transactions.

SQL, the de facto query language in the relational database world, is forcing the convergence — at least on the interface level — of the OODB and relational language interface. SQL operates on a predicate-search idea that is directed against structures of data that are unknown. OODBs are based on a navigational model of pointers that have a known structure. Many OODB advocates are touting extensions to the SQL language that let you query objects as well as tables. This is a natural evolution for SQL (assuming it's done right).

Object SQL or OSQL (we prefer the term SQLO — pronounced 'skweelo') is being pursued by Data General, Hewlett-Packard, Object Design and others. Adapting SQL for object extensions would provide a high-level interface that would take the primitive notion of an object and combine it with a set of functions that have a single argument. This could be a very powerful interface and smooth the path for migration from the relational world to the *real* world of object orientation.

Doing some debunking

One effect of the relational-versus-object-oriented debate is that it gives rise to extravagant claims on both sides about both technologies. Whom are you to believe? We feel some 'myth management' is in order. Here are a few myths that need debunking.

- **Relational databases are non-navigational** If you've ever tried to implement SQL in Cobol or defined a 'cursor' for a complex join with embedded updates, you know this one is a myth. A good definition of 'curser' is someone attempting to code a navigational problem in a non-navigational language.

- **Object systems relieve you from strong typing** Although object systems successfully hide data representation details, they may still require that you know the types of data/objects in requests or operations. In the language environment, strong typing and data hiding prevent methods of different libraries from clashing in their use of data. In the database world, method of access means that new methods and new fields don't require changes in the old applica-

tion. Strong typing is a property of the systems language. For example, OODBs that are extensions of C++ will be 'blessed' with C++'s strong typing.

- **Relational databases are value-based, not pointer-based** What kind of 'value' is put in a field called **SSN-TIE-BREAKER** or **PART-REC-SEGMENT**? When an index or even a program accesses **ROW-ID**, what kind of meaningful application domain does that come from? In fact, relational database vendors are sneaking pointer-based algorithms into their products like the way parliamentarians grant themselves pay rises. In the real world, expediency rules.

'Contemplating the coming changes in database technology is like sitting at the water's edge at low tide praying you don't get wet.'

- **C++ is the standard for object data management** We've avoided making the point that SQL is such a successful standard that there are several different ones to choose from, but we can't sit idly by while C++ is touted as a de facto standard for OODBs. De facto it is, indeed, and we applaud AT&T's co-operation in driving standardisation of the language, but database standard? We fear not. It serves well as a schema-definition language, but it doesn't give the application programmer a clue as to how to get things to and from the OODB. Luckily, C++ is an extensible language, and the OODB gang has taken the liberty of extending it to manage persistence. It is critical that the OODB vendors work hard to agree on standard in this interface.

- **Relational databases support online transaction processing better than OODBs** The third-generation database goal of 100 transactions per second (typically based on a benchmark defined by the Transaction Processing Council) is both laudable and achievable, but it doesn't have much to do with relational databases in particular. It took these systems many years to catch up with the performance and throughput of the hierarchical databases, and no doubt it will take OODBs a while as well. The point is that the efficiency of storage and lock mechanisms has less to do with the underlying data model than with the design

of the particular database product. There is no shortcut: if performance is crucial to your decision, run your own benchmark.

- **OODBs have unlimited flexibility** The enormous improvement in flexibility you can derive from the object paradigm is well known, but, at this time, it generally depends more on the object language than on an OODB. Object orientation means fair sailing for good designs, but leaky designs sometimes sink. Part of the cost of 'modelling reality' is the pain of fixing things if you got that reality wrong. The object paradigm gives you control points to manage dependencies when a restructure is required, but it gives little assurance that you can accomplish 'schema migration' easily. Flexibility can be the rope to hang yourself by.

Reality check

Everyone is familiar with the types of business applications (eg, accounting and report writing) where relational databases excel. So, just where are OODBs making headway?

The majority of the object databases are not commercial products, but proprietary systems built into CAD products by companies like Mentor Graphics. These vendors spent many years and millions of dollars in R&D concluding that relational databases were incapable of managing the complexity and throughput they required. They built their own databases because they had no other choice. This built-in market is, in fact, the main factor in the recent rash of start-up companies in the OODB field. Over the past two years, the primary standards body defining the International Standard Organisation data structures for design data, the Product Data Exchange Specification (PDES) committee, has moved firmly in the direction of object-oriented specifications. (Whether these will be slanted towards OODBs or object layers over relational databases remains to be seen.)

Because CAD is basically closer to a simulation problem than a data management problem, it is desirable that the database support a powerful semantic model. Also, because the relationships between items of data are very complex and constantly changing, the database for a CAD system must provide support for vectors, tables, linked lists and such because these things constantly recur in a very tangible form in the design data.

The pattern of data access in CAD is also different from that of commercial databases. Typically, a design object, such as an IC, is composed of thousands of design elements. Design elements may have connections with external items, such as physical layout, component

specifications or analytical data. When the designer looks at the IC, all the nested elements and many of the associated ones need to be quickly loaded from the database as a cluster. Experience has shown that this combination of aggregate access, and complex internal and external structure cannot be efficiently implemented in a relational database.

Another application demanding complex structures is Geographical Information Systems (GIS), but here the database demands are a little different. At least one vendor, Wild Leitz, a Prime Computer subsidiary, has implemented GIS using an object layer over a relational database. This implementation, however, involved significant extensions beyond typical relational capabilities, including built-in data procedures and extensible data types. The reason relational technology is an attractive option here is the relative emphasis on elaborate queries against the GIS database, rather than manipulation of the structure. The historical power of relational databases in managing ad hoc queries and linking internal and external databases can add significant value in this case.

Paradigm limits

To a person with a new hammer, everything starts to look like a nail. And it is inevitable that some people will choose a relational database or an object-oriented one for a job more suited to the other.

For example, what if engineering design data were stored as relations? A typical shipbuilding project manages three million different parts, each of which includes 512K to 10M of design primitives (ie, the geometry and topology of the part), plus 10 to 200 scalar attributes, and up to 10M of analytic data. Each part will be maintained in about seven different versions, making the potential complexity of interaction enormous.

The PDES model for engineering data management can be expressed with about 16 object classes and 30 types of object links. In contrast, this type of engineering data management would require hundreds of relational record types and possibly thousands of join links, each of which would have to be separately supported in the application. This is not balanced by any real benefits of relational technology, because ad hoc queries and data restructures are relatively rare in this arena.

On the other hand, imagine if bank accounts were managed as pure objects: a teller transaction would 'check out' the account object to credit it. A concurrent ATM transaction, finding the account locked, would generate a new version to

debit it. Meanwhile, an enterprising branch manager could use a subclass to customise the interest algorithm for some accounts. What do you suppose the auditors would make of all this?

In these two extreme examples, you could get working applications from the 'wrong' technology, given time and a good developer. The point is, where a problem doesn't require the most powerful features of a tool, it just clouds the issue to have them hanging around. You should quite rightly shun any hot technology that is focused on problems you aren't experiencing.

The table shows how relational and object-oriented databases differ. Your job is not to decide which is intrinsically better, but to decide which one better fits your needs.

Closing arguments

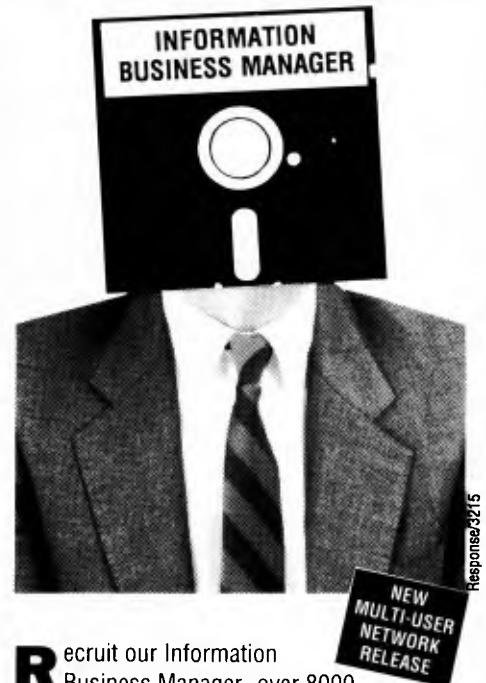
OODBs overlap with earlier semantic data models and provide a much richer environment than the relational model. The generalisation and aggregation relationships inherent in object-oriented models have stimulated a reinvestigation into the architectural concepts that were originally developed for relational database systems. These concepts include schema evolution, queries, concurrency control, storage structures and indexing. OODBs are evolving as a result of the limitations in the relational model — particularly its inability to handle complex data types.

The extensions to the relational model proposed by many pundits, academics and evolutionists will set the inevitable direction for relational companies. The fact is that most of them (including supporters of the *Third Generation Database System Manifesto*) are adding object-oriented extensions on the front end of their products. Over time, there is nothing to prevent them from moving to a full OODB. The issue becomes religious in that technically-led companies will find the shift towards OODBs more difficult than market-led companies. The problem is that people in the computer business like to make things much more difficult than they really are or should be. It's never black or white. It's always anthracite, taupe or flesh tone.

An OSQL and OODB can move you forward in time so that you can start working on the real problem with data management: getting people to manage the data. Contemplating the coming changes in database technology is like sitting at the water's edge at low tide praying you don't get wet. You can either jump in now, run in the other direction or wait until the tide surrounds you.

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Printing LaserJet files in booklet form

A README disk file is a convenient way for a software seller to extend the life of his already printed documentation, but at best it's a nuisance for the buyer. COPYING README to PRN simply produces a mass of unnumbered pages that don't even fit within the documentation package. And trying to reformat the file with your word processor not only takes a lot of time, but usually still sends you looking for the paper cutter.

PCBOOK eliminates all this hassle. It prints your README (or similar) files on double-sided pages arranged so that with one fold they become a neat little brochure that fits right into the regular documentation booklet or diskette sleeve. All you have to do is select the file and options — which include automatic page numbering — and reload the paper once, in order to print the back side(s).

PCBOOK is designed to work with an HP LaserJet Series II, IIP or III. No additional printer memory or external fonts are required. Because it prints in landscape mode — on both sides — and uses the built-in Line Printer font rather than the larger, default Courier, PCBOOK can put four standard pages of 80 characters per line, 66 lines per page, on a single 8.5 by 11 in sheet. The formatting of the original file is retained, so indenting, columns or code listings will print out correctly.

The easiest way to obtain a copy of PCBOOK is to download its .EXE file from APC MAGNET on Telecom's Discovery 80, as explained in the text box 'Downloading from APC MAGNET'. Alternatively, you can send in a blank, formatted, 360K 5.25 in disk with a stamped, self-addressed package to November Productivity, 122 Ormond Road, Elwood 3184. The source code, PCBOOK.BAS, is written in QuickBASIC and can also be downloaded from APC MAGNET. If you wish to customise the program (see the text box 'Customising PCBOOK'), you'll need Microsoft QuickBASIC 4.0b or 4.5, or version 6.0 or 7.0 of the Basic compiler.

Using PCBOOK

The full syntax for PCBOOK is

```
PCBOOK [path]filename [/F] [/P]
        [/D] [/C] [/2] [/A] [/W] [/S]
        [/B]
```

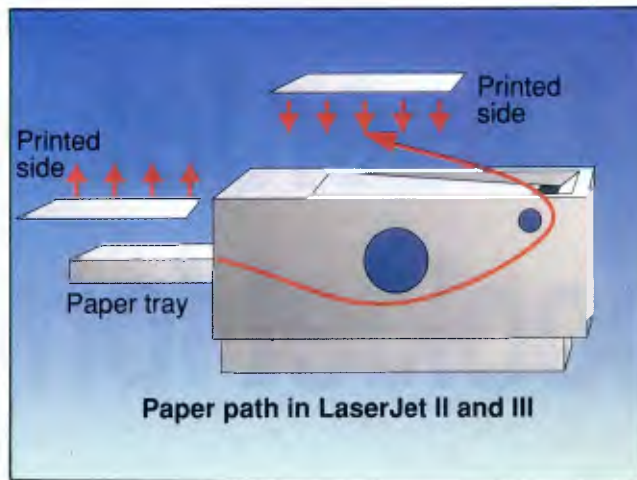
The *filename* can designate almost any regular text or ASCII file, including those created with APC's TED.COM or Borland's SideKick. Each line of text must be terminated by a carriage return and a line feed character, and you may include form feeds (also called 'page feeds') to force page breaks within the text. Note that PCBOOK does not (by default) wrap lines with lengths greater than 80 characters. As explained in more detail below, text files with longer lines can be printed with line wrap (not word wrap) by including the /W switch in the command, though at the cost of a small degradation of speed. Since most README files never exceed the 80-character width of the screen, this switch option will be needed only occasionally.

When entered with a filename, PCBOOK begins by calculating the number of sheets needed for printout. After displaying this total, the program proceeds to print the front side. If you run out of paper on the first pass, you are given the option to reload and continue or to cancel. (It's a good rule of thumb to keep your paper tray filled at least half way; it helps avoid paper jams.) If you want to know the number of sheets of paper required before actually printing, start PCBOOK with the /C switch added. PCBOOK will pause after displaying the number of sheets the file needs. Now you can press ENTER to continue or hit the Esc key to cancel printing and return to the DOS prompt. After PCBOOK has completed printing the first side, it will prompt you to reload the pages in order to print the second side.

Reloading the half-printed paper is easy. If you use the normal top-bin output

The painless way to handle README and similar files is to turn them automatically into handy booklets. Jay Munro explains how.

Fig 1 In normal printing, the LaserJet printers turn the paper over for you, so to print the sheet(s) on side two, you merely reload the half-printed sheets without changing the way they have come out of the printer



to collect the printed sheets, simply transfer them back on top of the remaining sheets in the paper supply tray. Just be careful not to flip or rotate the pages in relation to the way they came out of the printer. The paper orientation through the LaserJet is text side up going in and text side down coming out, as illustrated in Fig 1. Note, however, that if you use the rear output tray on the LaserJet, you will have to turn the stack of sheets over before loading it into the paper feed tray for side two printing. When you've reloaded the paper into the supply tray, press Enter to continue printing to the end of the file.

When its print job is complete, PCBOOK displays a message on the screen and returns you to the DOS prompt. All you need to do then is to staple or fold the booklet together. Naturally, before running the program, you should have your LaserJet turned on (unless you plan to select the /A switch as described below), stocked with paper and online; some of the error messages have a long time-out before they appear.

PCBOOK options

A printed header on each page is frequently useful, and PCBOOK has three optional switches for including header information. The /F switch prints the source filename in the centre of the header; /P prints the current page number on the outside of the page; and /D prints the current date on the inside of the page. The header can use any or all three options. If a header is used, the text will start one line below and will still be 66 lines long. By default, the header, if used, will be printed on all but blank pages. (If you want headers on all the pages, see the text box 'Customising PCBOOK' for more information.)

LPT1 is the default printer port for PCBOOK. If your LaserJet is connected to LPT2, simply include the /2 switch when you issue the PCBOOK command. Note

that since QuickBASIC supports only LPT1 or LPT2, these are the only parallel printer ports supported by PCBOOK. If you need to use the LaserJet in serial mode, use the DOS MODE command to set up the port and redirect from LPT1 or LPT2. (PCBOOK could be modified to use COM ports, but it's simpler just to follow the procedure explained in the DOS manual.)

Including the /A switch causes PCBOOK to prompt you for a filename instead of using LPT1 or LPT2. The file created will include all the printer commands that normally would be sent directly to the printer, so you need only copy the file to a LaserJet later to get your printout. The /A switch can also be used to force a dry run of the print by using the DOS device NUL as a filename. When you're in the process of modifying the program, this is a handy way to do your debugging without burning reams of paper.

The /W switch instructs the printer to wrap lines that would otherwise extend beyond the right margin onto the next line. When PCBOOK is calculating page breaks, the extra lines are added to the count to keep pages printing correctly. The LaserJet wraps lines on a character basis, unlike a word processor, which breaks long lines on word boundaries. When the /W parameter is not used, PCBOOK defaults to line wrap off, so lines that extend into the margins will be truncated.

Using the /H switch tells PCBOOK to display its syntax and a short description of all the switches, and then return to a DOS prompt. The /S switch, if used, adds a beep when PCBOOK successfully prints a side.

How PCBOOK works

PCBOOK can create a booklet from a text file of any reasonable size. To overcome the problem of limited string space, PCBOOK makes use of a 513-element

LONG INTEGER array called PtrArray&() to provide pointers into the file. Each element represents the location in the text file where a new page starts. The result is that 512 pages can be printed. The array elements used are always one more than the rounded-up number of pages. At 80 characters per line and up to 66 lines per page, the upper limit is a file of 2,642,240 bytes.

PCBOOK opens the text file as a binary file and reads it into a buffer. The buffer is scanned for line feed (LF) and form feed (FF) characters, using Basic's INSTR function. If both are found, the form feed position is compared with the line feed position. If the form feed is closer to the start of the scan, the page count is incremented and the offset into the file is recorded. If the line feed is closer, then the current line count is incremented. The page is incremented and recorded when the line count reaches 66 lines, and the line counter is cleared to start again.

As the buffer is exhausted, another portion is read from the file; this continues until the whole file is processed. The input file is then closed and the last element of the pointer array is set to the length of the file.

The actual printing begins with clearing the LaserJet of any temporary macros, temporary fonts, and text and margin commands that may be left in the printer from earlier use. (Hewlett-Packard recommends resetting the LaserJet at the beginning and end of every print job.) All the commands used in PCBOOK are temporary and will be cleared at the end of the printing.

First, PCBOOK selects the escape sequences to put the LaserJet into landscape mode. It then selects the sequences for the Line Printer font and the Pitch and turns off the default perforation skip. (The default setting of the perforation skip causes the LaserJet to eject a page when the printing goes past the number of lines set on the front panel. Since PCBOOK prints up to 68 lines per page when using a header, this would create a problem.)

The Macro function is a very handy, though underutilised feature of the LaserJet Series printers. You can create up to 32 macros with a standard Series II (up to 32,768 macros using a Series IIP or Series III and enough printer memory), and they can be called with a single command. Using printer macros to control the margins of the left and right side of the sheet reduces the number of commands sent to the printer for each page.

An escape command is sent to signal the start of the macro. Almost any instruction that follows can then be recorded and assigned to the macro. To terminate the macro, another escape sequence is sent to show where to stop. The macro is then

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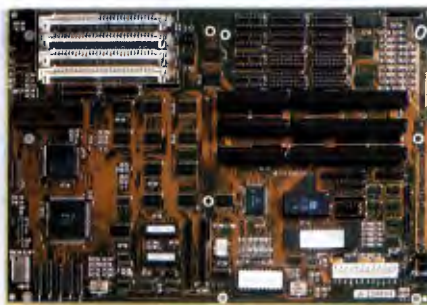


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Customising PCBOOK

A QuickBASIC program like PCBOOK should not, by any means, be considered untouchable. Starting from the basic working program, you should consider making modifications both to add desired features to the program and to further your knowledge of programming in general. As you trace through the source listing of a program, your imagination should set you to asking yourself, 'What if . . . ?'. To jump-start your creative juices, here are a few suggestions.

Printing the filename on every page is fine for program listings, but a title like LGR4DEC.TXT might be a bit cryptic for the general user. By adding an input statement to prompt for a descriptive title, the header could be made clearer. A new switch, such as /T could trigger the prompt and set the PC.DoHeader flag for printing. A one-line title of up to 80 characters could then be added comfortably. Since a LaserJet macro may contain the text as well as the printer commands, your title could be loaded into the printer only once as a macro and called by number to be printed.

While you're at it, perhaps the page numbers would look nicer in a footer. Just set up the page numbers in the same manner as in the current header, but print the string at the end of the page instead of the beginning. After printing the page, use LJLocate to position the LaserJet cursor at line 68 and print the string.

To put a larger amount of text on each page, legal size paper could be substituted. Modify the macros one and two for wider margins and change PC.LineLen to the maximum number of characters that will fit in between. You may want to experiment with the lengths of the lines by creating a simple test file of numbers 1234567890, repeating on each line. Then, when you print the file, count the zeros as 10 (characters) and add the last number to find the length of a line with the new margins. For example,

```
1234567890123456789012345678901234
```

is 34 characters long. Of course, you must not use the /W option at this time.

The best place for a program README file is with the original documentation. Depending on the method of binding or finishing your booklets, the centre area or gutter of the pages produced by PCBOOK may need to be adjusted. To accommodate a three-hole punch, the PC.LineLen value should be made smaller and the centre margins made wider.

To keep up with the latest fads in documentation, any extra blank pages that must be added when the text comes up short could be printed with the classic 'This page intentionally left blank'. Alternatively, you could be creative, with 'This page is not really blank

is it?', or 'This space for rent, enquire . . .' Again, a LaserJet macro would fit the bill nicely.

As hinted in the text, users of Microsoft's Professional Development System may want to replace the OPEN for INPUT section — that tests for the existence of the text file — with the new DIR\$ function. The line

```
IF LEN(DIR$(Filename$)) = 0 THEN  
GOTO GetName
```

will check the file without ON ERROR. Because the check is now contained locally, the user input section can be moved to its own module, making a cleaner program. The DIR\$ function may also be used to add multiple file printing. An array of filenames can be created and fed to PCBOOK for printing.

PCBOOK works best on files of at least three or more pages, but for single or two-page files, a special condition could be added to print only on one side of the paper.

Finally, to print a header on every page, whether blank or not, remove the

```
IF PC.DoHeader THEN
```

statement from the two-page printing routines under the DoPass label. Calling Header prints every page with the header information.

defined as either permanent or temporary. For our purposes, the macros are made temporary and will be cleared at the end of the job.

The actual printing of the text file is done with Basic PUT and GET statements using pointer array values that correspond to the page to be printed. For example, to print page three, the value in element 3 is subtracted from element 4 to determine the length of page three. A string buffer is created with this length, and the whole page is read from the text file into the string with Basic's GET using the value in element 3 as the SEEK (or starting) point in the file. The string is scanned for a line feed character; in its absence, PCBOOK prints the entire buffer string. If a form feed is present, the string is printed up to, but not including, the form feed. Because the LaserJet printer recognises carriage returns, line feeds and form feeds, the whole page can be sent to the printer in one print command. Printing the complete page string is much faster than printing a line at a time.

Booklets must always have an even number of sheets, and the total page

count should be rounded up to the next multiple of 4. Once rounded up, the number of pages is divided by four to reflect the number of sheets to be printed. For example, a 41-page file will be rounded up to 44 pages, resulting in 11 sheets being printed upon, though the last three pages will be intentionally blank.

To create a two-sided booklet in the correct format, the pages cannot be printed sequentially. On the first pass, printing starts with the first page (page 1) on the right and the last page on the left. The pages are increased by two on the right and decreased by two on the left. At the end of the first pass, half the pages in the file have been printed on the paper. To print the other side, the sheets are reloaded into the paper tray. The second pass starts with the centre of the book — pages 21 and 22 in the example above — and continues incrementing and decrementing the pages by 2 until done. In this way, when the sheets are removed from the printer and folded in half, the pages will be in the correct order for reading.

A programming overview

PCBOOK has four major sections.

1. Initialisation, command-line parsing and user input
2. Input file processing
3. Printer setup
4. Input file printing

The initialisation portion of PCBOOK assigns default values to many of the variables that are subsequently used throughout the program. Even though PCBOOK is a modular program, it is still a single Basic file and can therefore use shared variables. Sharing certain variables cuts down on passing often-used values. Furthermore, PCBOOK represents all numeric data using integers (short or long) for speed and smaller code size.

The command line

QuickBASIC provides a reserved string variable called COMMAND\$ for all command-line input, and PCBOOK uses the command line as the main entry point for

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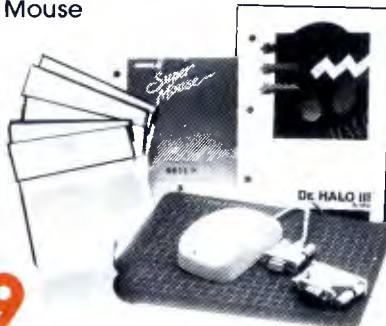
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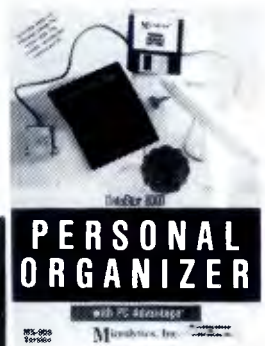
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Talking to your LaserJet

To many programmers, LaserJet escape sequences look like hieroglyphics. But while a statement like

```
ESC(8UESc(s0p16.67h8.5v0s0b0T
```

looks so fearsome as to stifle any thoughts you may have had about programming your printer, the LaserJet language (PCL) is really quite easy to understand. Moreover, it's an extremely powerful text and graphics printing language. By knowing a little about how PCL is structured, you will be on your way to designing your own LaserJet programs.

PCL is divided into two types of commands: control codes and escape codes. Control codes are single characters, such as carriage return (Ctrl-M), line feed (Ctrl-J) or form feed (Ctrl-L). Printing control codes in Basic is usually done by sending the appropriate CHR\$() character, for example, CHR\$(12) for page feed.

Escape codes are commands that have two or more characters, the first of which is always an ASCII ESC character (in Basic, a CHR\$(27)). The ESC character is a signal to the printer that the following character or characters are a printer command.

PCL escape commands are further divided into two types: two-character escape sequences and parameterised escape sequences. Two-character commands consist of the ESC character and one other character. The printer reset command, ESC*, is an example of a two-character command.

The parameterised escape sequences are the heart and soul of the PCL language. The escape sequence shown in the first paragraph is an example. Within a parameterised sequence, ASCII characters can function either as data or can represent the type of command or data. The following example shows the escape sequence to position the LaserJet cursor at the fifth row.

```
ESC&a5R
```

The five components of this sequence break down thus:

1. ESC — the normal ASCII escape character.
2. & — a character — an ASCII character with a value from 33 to 47 decimal (! to /) — that signifies that the escape sequence is parameterised, that is, the printer is to expect more characters in the sequence.
3. a — a group character — an ASCII character with a value from 96 to 126 decimal (' to ~) — that specifies the group to which the command belongs. The 'a' group affects cursor-positioning and margin-control commands.
4. 5 — a value field. Depending on the command, this field may be actual data or an index to the group of commands. In this example, it's the number of the row at which to position the cursor. Font control sequences use this field to specify action to take on the last font specified.
5. R — the termination character — an ASCII character with a value from 64 to 94 (@ to ^) — signifies the end of the command and the parameter (in this case the row) to which it applies.

This sample parameterised sequence performs only one function: it positions the cursor on a specific row (5). To position it at a specific column (6), for example, another similar sequence must be sent:

```
ESC&a6C
```

As you can probably imagine, sending all those ESC sequences could become cumbersome. Fortunately, PCL offers a shortcut.

When the same parameterised and group characters are used for a number of commands, the multiple escape sequences can be combined, thus reducing the number of characters to be sent. To send the two commands above separately would require 10 characters. They can, however, be combined in the following way:

```
ESC&a6c5R (=ESC&a6C + ESC&a5R)
```

In this sequence the ESC, parameterised and group characters are not repeated, reducing the number of charac-

ters from 10 to 7 — a 30 per cent saving on overhead. The termination character (R) remains in uppercase, but all other alphabetic characters (in this case, only a c) become lowercase.

When escape sequences are combined, the commands are executed by the printer from left to right. In the above example, the LaserJet cursor is positioned at the sixth column first and then on the fifth row. In some situations the order of commands can be important, so knowing how commands execute could prevent bugs.

To use PCL commands from QuickBASIC programs, send all commands as strings. PCL commands can be built by concatenating strings and values to create a single string to send to the printer. Using our above example, the QuickBASIC syntax is

```
LPRINT CHR$(27); "&a";  
LTRIM$(STR$(Col%)); "c";  
LTRIM$(STR$(Row%)); "R";
```

The two integer values, Col% and Row%, must be converted into strings by the STR\$ command, and the LTRIM\$ functions remove the leading space that STR\$ puts on. Occasionally, QuickBASIC version 4.0 and later has problems with complex string concatenations. If you find problems printing certain concatenated strings, the workaround is to create a temporary string first, then print the temp. For example:

```
Temp$ = CHR$(27); "&a";  
LTRIM$(STR$(Col%)); "c";  
LTRIM$(STR$(Row%)); "R"  
LPRINT Temp$;
```

For more information about PCL and programming the LaserJet printer, refer to the technical reference manual for your model. Unlike many such references, the Hewlett-Packard manuals are written in clear and concise language and cover almost every aspect of programming the printer.

Now that you have gained this much insight into the LaserJet language, try to decode the lengthy first example. (Hint, it's from the font test printout on a LaserJet III.)

parameters. Unlike C, which parses the command line into separate arguments, QuickBASIC users must parse the line manually. To keep the program size down, PCBOOK is coded to expect the filename parameter first, though optional switches thereafter may be entered in any order. LTrim\$ is used to trim lead-

ing spaces that could inhibit the parsing of the filename. If the first character encountered is a /, PCBOOK assumes that no filename was specified and prompts you for one.

QuickBASIC's powerful INSTR function is used extensively throughout PCBOOK to scan strings for matching characters.

INSTR takes a source string and a search string argument and, with an optional starting-position argument, returns the position within the search string where a match begins. A 0 is returned if no match is encountered.

PCBOOK scans for each / switch separately and sets flags or variables ac-

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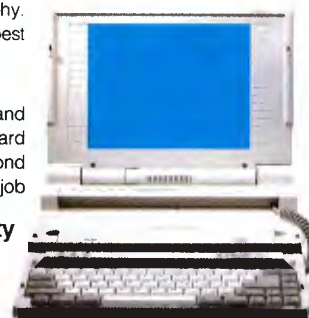
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cordingly. The /F, /P and /D switches are grouped together and printed if any or all are specified. The header module creates a blank string 80 characters long, using MID\$() to position the filename, page number and date with the string for printing. If any of the three header switches is set, the PC.DoHeader flag is also set to signal that a header is to be used.

When the program starts, it must check for the existence of the input file. QB's ON ERROR facility is used in conjunction with the

OPEN filename\$ FOR INPUT AS #1

statement to force an error if the file is not found. If the error is generated, the program will resume at the file-input prompt to try again. Programmers using Microsoft's Professional Development System may use the DIR\$ function to accomplish the same thing. It may seem redundant to open the file just to see whether it exists: after all, the file will be opened for use in only a few lines. However, when the file is opened for use, it is with the FOR BINARY qualifier. When QuickBASIC opens a file variable for binary I/O and the file does not

exist, it is simply created and no error is generated. Thus, PCBOOK would try to open it and try to print a zero-length file.

After the input file has been established, the COMMAND\$ is checked one last time for the /A switch. If it finds an /A, PCBOOK prompts the user for an alternative filename or device. The Out-File\$ default of 'LPT1' or 'LPT2' is changed to the new name.

Input-file processing

The BuildArray module is the core of PCBOOK and is called by the main module. The text file is opened FOR BINARY as #1 and read into the Buffer\$. Using Basic's INSTR function to scan for page feed and line feed characters, it locates virtual page breaks and stores them as an array of pointers into the text file. Using the full syntax of INSTR to scan the Buffer\$, the parameter StPtr% is used as an offset or starting point within the string. The positions of the matches are recorded with TempLn% and TempPg% for line feed and form feed, respectively. As matches are found, the StPtr% is updated to point to one byte or character past the last match. By sliding the StPtr%

along, the whole string is eventually scanned for form feed and line feed characters.

The actual pointers into the text file, PtrArray&(), are built by adding the position of the form feed in the current Buffer\$ to the Offset& variable. Offset& is a pointer into the text file at the point where the buffer was last read. Offset& is updated on every Buffer\$ read by adding the last Offset& to the length of the last Buffer\$. StPtr%, the current position variable for the buffer, is also initialised at every read to ensure valid data.

The size of the file is found using the LOF() function. This information is kept in the TotalSize& variable. TotalSize& is compared with Offset& before each Buffer\$ read. When the value in Offset& is equal or larger than TotalSize&, the operation is complete and the file is closed. Because Basic's GET uses the length of the Buffer\$ to determine how many characters it reads, TotalSize& is also used to resize the Buffer\$ when the file has fewer characters left than the default BufSize%.

PCBOOK uses PtrArray&() values to SEEK into the text file at the correct page numbers. The difference between the current PtrArray& value and the following



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one is the length of the page in characters. In order to calculate the size of the last page, the last `PtrArray&()` element is assigned to `TotalSize&`.

Printer setup

Once the `PtrArray&()` has been created, the printer is initialised by sending LaserJet commands with the `PrintSetup` module. Most LaserJet commands are prefaced by an escape character (`BASIC CHR$(27)`), so to simplify sending the escape codes, I created a shared variable, `ESC$`. `PrintSetup` first resets the printer with an `ESC$;"E";` command. After the reset, an `ESC$;"&110";` is sent to set page orientation to landscape mode. Both the reset and orientation commands will cause the printer to print and eject any data left in the machine prior to the commands. Notice that every `ESC$` string here has a semicolon appended. When using the `Print #` statement, `QuickBASIC` normally prints a carriage return and line feed after the string. If you place a semicolon after the string, however, the carriage return and line feed will not be printed. Without the semicolon, the `ESC$;"E"` would reset the printer and send a carriage return/line feed. When the landscape mode command is received, the printer would print a page and then continue.

The LaserJet macros used in `PCBOOK` are created by the HP macro-control commands. The ID code and start macro code, `ESC$;"&f#y0X";`, define the beginning of the macro with the ID number substituted for `#`; for example,

```
ESC$;"&f2y0X"; 'Macro ID number 2
```

Escape codes to be included in the macro are then sent. The macro is terminated with the escape code, `ESC$;"&f#y1X";`; and then defined as temporary with an `ESC$;"&f#y9X";` code. (For more discussion of the LaserJet escape commands, see the text box 'Talking to your LaserJet'.)

Printing the input file

Now that setup and processing are completed, it's an easy ride from here. The actual printing of the text file is done a page at a time, read from a particular location in the file — but not in sequential order — with Basic's `GET` command into the `Buffer$`. The process is similar to that followed in the `BuildArray` subroutine, except that the `PtrArray&()` is used rather than created. `QuickBASIC`'s `GET` command syntax is

```
GET #Filenum, Position& , Buffer$
```

`Filenum` is the Basic file number with

which the text file was opened. The `Position` is set using the `PtrArray&()` element that contains the starting point for the page needed. The `Buffer$` is a string padded to the length of the page. For example, the current left side `Buffer$` is padded with spaces using the basic statement:

```
Buffer$ =  
Space$(PtrArray&(LeftSide%+1)  
- PtrArray&(LeftSide%))
```

As we saw when we built the `PtrArray&`, the values in each element represent page breaks, so by subtracting the next-higher page from the one we need, we get the length of the page. The variables `LeftSide%` and `RightSide%` track the current portion of the page to be printed, while `BookMark%` tracks the number of sheets left to print.

When a form feed (`CHR$(12)`) is found in the text and recorded as a page break in the `BuildArray` module, the actual form feed character is counted in the page length. As the page is printed, the form feed must be removed, in order to keep the correct sheet order. An `INSTR` scan is done on the current `Buffer$` to search for a `CHR$(12)` and, if found, the string is printed only up to that character; otherwise the whole buffer string is printed.

`PCBOOK` reads the pages to print in the order of printing — not necessarily in sequential order — by using Basic's `GET` statement with the position specified by `PtrArray&()`.

After printing the left and right sides of each sheet, `PCBOOK` issues a form feed character. The program prints a text file in two passes, each pass printing one half of the pages. As each page is printed, the variables `LeftSide%`, `Right-`

`Side%` and `BookMark%` are updated. `LeftSide%` is decreased by two and `RightSide%` is increased by two because we are printing every other page on each pass. `BookMark%` is reduced by one each time to track the number of physical sheets being printed. When `BookMark%` reaches zero, it signals the end of the pass.

The flag `FirstPass%` was set to a -1 at the start of the program and it is now tested. If `FirstPass%` is true (-1) then `PCBOOK` prompts the user to reload the printed sheets and press Enter. The `INKEY$` do/loop allows only two choices, Enter and Esc. By giving you only two ways to continue printing, the program eliminates the possibility that an accidental keypress will cause `PCBOOK` to resume printing before the sheets have been reloaded. The Esc key may be selected to cancel any further printing and end the program.

Assuming the user selects Enter to continue, the `FirstPass%` flag is set to the value zero and the program loops back to the `DoPass` label. At the end of the second pass, since the flag `FirstPass%` was cleared before, `PCBOOK` prints the message 'Printing Done' to the screen and exits. On exit, an `ESC$;"E";` resets the LaserJet and Basic's `CLOSE` statement closes all files.

Error trapping in `PCBOOK` is minimal but sufficient to avoid 'Abort, Retry, Fail' messages from the operating system. If the printer is offline or the power is off, Basic issues an error 24 or 25. Running out of paper will cause the program to return an error 27. Almost any other error will be reported by number, and if applicable, with the device name with which the error occurred.

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Roll your own DOS extender

In the first of a two-part series, Al Williams explains how you can develop your own 386 protected-mode applications.

The 80386 is chock-full of advanced features that support modern applications and make programming easier. Unfortunately, DOS programmers can't take advantage of many of these features because DOS is unable to use the 386's special protected mode. So what can you do when you need to write PC programs that require large amounts of memory, multi-tasking or other sophisticated features?

One solution is to move to a protected-mode operating system such as Xenix 386 or OS/2. Another approach is to turn to a DOS extender that provides some mechanism for interrupt-driven I/O and for making DOS and BIOS calls in a protected-mode program. Some DOS extenders switch between real and protected mode to handle interrupts and make DOS calls, but the preferred method runs DOS in virtual-86 mode, which causes the 80386 to emulate an 8086. (See the text box 'Protected mode operations on a PC' for more details.)

Actually, running protected-mode programs on a 386 is not very difficult if you don't need to access the system calls or perform any interrupt-driven I/O. However, your programs will often need to do disk and keyboard I/O, as well as make calls to DOS and the BIOS.

In this two-part article, I'll present a DOS extender, PROT, that deals with interrupt-driven I/O along with most DOS and BIOS calls in protected mode using virtual-86 mode. In this first instalment, I'll discuss protected mode in general and the basics of PROT in particular. In the December issue, I'll cover debugging issues and 80386 exceptions and take you under the DOS extender's hood.

To implement this system, you'll need Microsoft's MASM 5.1 or Borland's TASM and an AT-style computer with an 80386, 80486 or 80386SX CPU, or an Intel In-board 386/PC. While all of the source

code listings (more than 2000 lines) that accompany this two-part article will be available on APC MAGNET, I'll cover Listings 1 to 3 in Part One and Listings 4 to 7 in Part Two.

About PROT

PROT.ASM (see Listing 1) and its associated *include* files make up a true, 32-bit DOS extender. This extender allows you to write assembly language programs that use 32-bit addressing and access all of the 80386's special features. In addition, PROT allows you to do I/O using the ROM BIOS or DOS. PROT also has provisions for direct access to the PC hardware (for instance, to write directly to the screen).

PROT doesn't allow you to call inter-



rupts that terminate your program (such as INT 20H or INT 21H function 4CH); instead, PROT provides its own calls for program termination. Obviously, the two BIOS calls that switch the processor into protected mode (INT 15H functions 87H and 89H) won't operate properly. (Their functions are superfluous under PROT anyway.) Since PROT doesn't allow program termination calls, it cannot deal with spawning DOS sub-processes using INT 21H function 4BH, nor does it allow the undocumented DOS command processor 'backdoor' interrupt (INT 2EH). Of course, if you must spawn a sub-

process, you can always return to real mode temporarily.

PROT does include macros to assemble some 32-bit instructions since the linker that comes with MASM doesn't handle certain 32-bit references properly. These macros are particularly useful when the assembler generates a negative 32-bit relative number. In that case, the linker only fills in the bottom 16 bits of the number, which changes the negative relative jump into a positive jump. The supplied macros overcome this difficulty.

The segments

Any program written with PROT starts with 23 segments that are defined in the GDT (although you can define more in

INT386.INC (Listing 5) for 386 interrupt handling; TSS.INC (Listing 6), which contains the task state segment definitions; and CODE16.INC (Listing 7), which is the 16-bit DOS entry/exit code. I'll cover the last four next month.

Writing a program

Your program goes into a file with a .PM (protected mode) extension. It should consist of the two user segments SEL_UDATA and SEL_UCODE. Execution begins with the **USER** procedure.

Example 1 shows the simplest possible PROT program; it does nothing except return to DOS. The **NODATA** macro declares an empty data segment, since the program uses no data. The line

segment, as shown in Example 1. The corresponding **PROT_DATA** and **PROT_DATA_END** macros allow you to define your main data segment if needed.

Most programs will make calls to DOS or the BIOS. In PROT, the **call186** routine makes this possible. This routine takes a pointer (in ES:EBX) to a parameter block (see Fig 1). A macro, **VM86CALL**, performs the far call to **call186**.

Example 2 shows a short DOS program that prints a message using DOS function 9 and the corresponding program written with PROT. The statement **PROT_STARTUP** (again, a macro in EQU_MAC.INC) sets the default parameter block's data segment and stack. You can override these defaults when you call **PROT_STARTUP**.



your program). PROT does not set up an LDT, but your code can easily set one up if you require it. The segments your programs will use are shown in Table 1.

When your program runs, the segment registers are initialised to the values shown in Table 2. GDT.INC (Listing 2) contains the names of all of the predefined segment descriptors. Your program will begin as a privilege level 0 task.

PROT's other components include EQU_MAC.INC (Listing 3), discussed in detail below; STACKS.INC (Listing 4), which contains the stack segments;

BACK2DOS is equivalent to **JMPABS32 SEL_CODE16, BACK16**, which returns to DOS. If you load a value in the AL register before making this jump, DOS receives that value as the return code. The **BACK2DOS** macro accepts an optional argument, which the macro loads into AL for you. PROT will also return to DOS if a breakpoint or an unexpected interrupt occurs. In this case, DOS receives a return code of 7FH.

The **PROT_CODE** and **PROT_CODE_END** statements are actually macros defined in EQU_MAC.INC (Listing 3). Use these macros to define your main code

When calling **call186**, all registers except the segment registers, EFLAGS, EBX and EBP are passed to the VM86 interrupt unchanged. EBX, EBP, EFLAGS and the segment registers receive their values from the parameter block. If you want the segment registers returned in the parameter block, set the first word in the block to a non-zero value. Otherwise, the parameter block remains unchanged. Upon return, all non-segment registers will contain the values returned by the **VM86** call.

The **SEL_DATA** segment defines a default parameter block (**paramframe**):

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Segment	Function
SEL_DATA0	4G (gigabyte) data segment starting at location 0. With this segment, you can address any memory location you please. Be careful.
SEL_GDT	Alias for the GDT. You may need this to add more segments or find information about the predefined segments.
SEL_VIDEO	4K data segment at video page 0. PROT determines your video adaptor type, sets the page to 0 and sets SEL_VIDEO to the proper address.
SEL_DATA	Contains PROT's system data area. Several useful variables reside in this segment.
SEL_IDT	Alias for the protected-mode interrupt vector table. You may wish to modify this segment so you can add interrupts to the system.
SEL_UCODE	Your program's default code segment.
SEL_UDATA	Your program's default data segment.
SEL_PSP	256-byte long data segment that contains your program's DOS PSP. You can use this segment to access the command line and other MS-DOS specific data.
SEL_ENV	Contains your program's DOS environment block.
SEL_FREE	Starts at the first free location of DOS memory and goes to the end of DOS RAM (640K or less).
SEL_EFREE	Similar to SEL_FREE, but begins at the start of extended memory and continues to the end of extended memory as reported by INT 15H, function 88H. If no extended memory exists, SEL_EFREE will have a limit of 0.

Table 1 Segments used by a PROT program

you may use this for all of your DOS calls, or for better performance you can

```
DS=SEL_UDATA
ES=SEL_DATA
FS=SEL_DATA0
GS=SEL_VIDEO
```

Table 2 Initial segment register values

```
File: USER.INC
; SET UP EMPTY DATA SEGMENT
      NODATA

; SET UP CODE SEGMENT - PROGRAM RETURNS TO DOS
      PROT_CODE
USER   PROC NEAR
      BACK2DOS
USER   ENDP
      PROT_CODE_END
```

Example 1 A simple PROT program

define multiple blocks by using the *vm86blk* structure in EQUIMAC.INC. For instance, you might define three different blocks: one for disk reads, one for BIOS screen writes and another for other BIOS calls. Do not use the other parameter blocks defined in SEL_DATA (*hintframe* and *cintframe*) in your programs. These parameter blocks handle hardware interrupts and critical errors exclusively.

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Protected-mode operations on a PC

If protected mode is so great, why isn't it used more often on 386 PCs? There are a host of difficulties in trying to get a DOS-based PC to do anything useful in protected mode. The primary difficulty is DOS itself; DOS expects to run in real mode. The same goes for the ROM BIOS (except in the PS/2-type computers). To remain compatible with the old 8088-based PCs, all 386 PCs have one of their address lines switched off to prevent accessing memory above 1M. Finally, some of the hardware interrupts used by the PC conflict with the interrupts the 80386 uses for error handling in protected mode.

With all of these obstacles, the prospect of running protected-mode programs on a DOS-based PC seems bleak. However, the PC's address lines and interrupt controllers are reprogrammable. Better still, the 80386 has a special mode (virtual-86 or VM86 mode) that allows old-style 8086 programs (like DOS or the BIOS) to operate in protected mode.

According to the Intel documentation, running 8086 code in VM86 mode is fairly straightforward. However, attempting to implement Intel's strategy fails when it comes to the PC's BIOS and DOS. Intel assumes that your 8086 code will always call interrupts with an **INT** instruction and return with an **IRET** instruction. However, this seems to be the exception rather than the rule with the PC's system code. Some DOS extenders deal with this problem by returning to real mode for each system call, then switching back to

protected mode upon completion. While this is fairly easy to implement, it causes problems if your programs are written to take advantage of the 80386's multi-tasking capabilities.

To run the BIOS and DOS in VM86 mode, you have to provide the 386 with a VM86 task. You have to emulate certain instructions, most notably interrupts. You also have to reprogram the hardware interrupt controllers and redirect their interrupts to the proper routines.

A VM86 task requires emulation for the **CLI**, **STI**, **LOCK**, **PUSHF**, **POPF**, **INT** and **IRET** instructions. This is to prevent the VM86 task from disrupting other tasks that might be running under protected mode. PROT emulates all of these instructions except **LOCK**, which isn't really an instruction but a prefix. Only multi-processor systems use **LOCK**, so PC software runs fine without it.

In theory, emulating **INT** and **IRET** is fairly straightforward. The execution of an **INT** or **IRET** in VM86 mode causes a general protection exception (**INT 13**). When you detect an **INT** instruction, simply determine the required interrupt vector address, simulate the interrupt, catch the corresponding **IRET** and return to the calling program. In practice, the PC BIOS and DOS do not always have a one-to-one correspondence between **INTs** and **IRETs** (a problem we will explore in detail next month). Only the normal **INT/IRET** sequence provides the **INT 13** required to emulate these instructions.

Some DOS extenders take different ap-

proaches. Some actually switch the processor back to real mode for each call to DOS or the BIOS. Other VM86 programs (such as EMS memory simulators) let real-mode calls run unprotected, which shuts you off from many of the 80386's special features and only allows DOS calls from VM86 mode. PROT actually runs DOS and the BIOS as a VM86 task.

Note that some of the protected-mode features that are also available in real mode are unavailable in VM86 mode. For example, a VM86 task can't switch the processor into protected mode in the same way a real-mode program can. This means some 386-specific software may not run with PROT. Also, some very specific BIOS routines that deal with extended memory and protected mode may not work. However, with protected-mode programming, you won't need BIOS services to manage extended memory or switch modes.

PROT provides facilities to handle Ctrl-C interrupts and critical device errors in protected mode. By default, PROT ignores Ctrl-C interrupts and has a critical error handler similar to the one provided by DOS. PROT also catches and ignores the Ctrl-Alt-Del keystroke that normally resets the computer since the PC's BIOS won't reboot in protected mode.

PROT reprograms the interrupt controllers so that hardware interrupts can co-exist with 80386 exceptions. When PROT detects a hardware interrupt, PROT automatically redirects it to the proper BIOS or DOS interrupt handler.

Address		Member name
BLOCK+0	Segment register flag (see text)	VMSEGLAG
BLOCK+4	Interrupt number	VMINT
BLOCK+8	EFLAGS	VMFLAGS
BLOCK+12	ESP	VMESP
BLOCK+16	SS	VMSS
BLOCK+20	ES	VMES
BLOCK+24	DS	VMDS
BLOCK+28	FS	VMFS
BLOCK+32	GS	VMGS
BLOCK+36	EBP	VMEBP
BLOCK+40	EBX	VMEBX

Fig 1 Parameter block for **call86** routine

Whenever you pass addresses to DOS and BIOS routines, you must ensure that they point somewhere in the first megabyte of memory. If you are using a lot of extended memory areas for storage, it might be wise to allocate one or two temporary storage areas in low memory just to handle DOS calls.

By default, PROT ignores Ctrl-C interrupts. Your program can test the flag **breakkey** in the **SEL_DATA** segment to see if a break event occurred. You can set the locations **break_seg** and **break_off** to the address of your own protected-mode break handler if you wish. The routine pointed to will execute after calling a DOS or BIOS routine with **call86** if a break has occurred. PROT also ignores the Ctrl-Alt-Del keystroke that normally reboots the computer, since rebooting in protected mode will cause the system to crash.

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Real mode program	
REALPGM	PROC
	MOV AX, SEG STACKAREA
	MOV SS, AX
	MOV SP, OFFSET STACKAREA ; SET UP STACK
	MOV AX, SEG DATSEG
	MOV DS, AX ; SET UP DATA SEGMENT
	MOV DX, OFFSET MESSAGE ; LOAD POINTER TO MESSAGE
	MOV AH, 9
	INT 21H ; PRINT MESSAGE
	MOV AH, 4CH
	INT 21H ; RETURN TO DOS
REALPGM	ENDP
PROT equivalent	
USER	PROC
	PROT_STARTUP ; SET UP STACK/DS
	MOV AX, 21H
	MOV PINTFRAME.VMINT, EAX
	MOV EDI, OFFSET MESSAGE ; LOAD POINTER TO MESSAGE
	MOV AH, 9
	MOV EBX, OFFSET PINTFRAME
	VM86CALL ; PRINT MESSAGE
	BACK2DOS ; RETURN TO DOS
USER	ENDP

Example 2 DOS and PROT code fragments to print a message using DOS service 9

PROT provides a default critical error handler similar to the one found in DOS. By setting *crit_seg* to 0 you can completely disable critical error handling and PROT will ignore critical errors. You can set *crit_seg* and *crit_off* to the seg-

ment and offset of your own critical error handler. A protected-mode critical error handler is very similar to a normal real-mode error handler. A real-mode handler gets status information in AX, DI, BP and SI. For protected-mode handlers, the AX

```
MOV EAX, 25H
MOV PINTFRAME.VMINT, EAX
PUSHF ; (Or PUSHFD)
VM86CALL ; Call INT 25 or 26
```

Example 3 Maintaining the caller's flags on the stack when returning in protected mode

```
echo off
if X%1==X goto :errexist
if NOT X%2==X goto :errexist
masm /DPROGRAM=%1 PROT.ASM, %1.OBJ, %1.LST;
if ERRORLEVEL 1 goto :exit
link %1;
goto :exit
:errexist
echo PMASM - An MASM driver for the PROT 386 DOS Extender
echo usage: PMASM progname
echo Assembles the file progname.pm into progname.exe
echo The PROT system is copyright (C), 1989 by Al
echo Williams.
echo Please see the file "PROT.ASM" for more details.
:exit
```

Fig 2 Batch file used to compile a PROT program with MASM



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Listing One

```

;*****
; * PROT - A 386 protected mode DOS extender
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; * You are expressly prohibited from selling this software,
; * distributing it with another product, or removing this notice.
; * If you distribute this software to others in any form, you must
; * distribute all of the files that are listed below:
; * PROT.ASM - The main routines and protected mode support.
; * EQU.MAC - Equates and macros.
; * STACKS.INC - Stack segments.
; * GDT.INC - Global descriptor table.
; * INT386.INC - Protected mode interrupt handlers.
; * PMDEMO.PM - Example user code.
; * PMPMD.PM - Alternate example code.
; * FBROWSE.PM - Complete sample application.
; * TSS.INC - Task state segments.
; * CODE16.INC - 16 bit DOS code (entry/exit).
; * PMASM.BAT - MASM driver for assembling PROT programs.
; * PTASM.BAT - TASM driver for assembling PROT programs.
; * To assemble: MASM /DPROGRAM=pname PROT.ASM, PROT.LST;
; * To link: LINK PROT;
; * pname is the program name (code in pname.PM)
; * if pname is omitted, USER.PM is used
; * The resulting .EXE file is executable from the DOS prompt.
; * This file is: PROT.ASM, the main protected mode code.
;*****

.XLIST
.LALL

.386P

; Name program if PROGRAM is defined
IFDEF PROGRAM
VTITLE MACRO PNAME ; temporary macro to title program
        TITLE PNAME
        ENDM
VTITLE %PROGRAM
        PURGE VTITLE ; delete macro
; equates and macros
INCLUDE EQU.MAC.INC

; stack segments
INCLUDE STACKS.INC

; Global descriptor table definitions
INCLUDE GDT.INC

; interrupt code
INCLUDE INT386.INC

; this is required to find out how large PROT is
ZZZGROUP GROUP ZZZSEG

;*****
; 32 bit data segment
DAT32 SEGMENT PARA PUBLIC 'DATA32' USE32
DAT32BEG EQU $

; 32 bit stack values
SLOAD DD OFFSET SSEG321-1
SSLD DW SEL_STACK

; This location will hold the address for the PMODE IDT
NEWIDT EQU THIS FWORD
IDTB DW (IDTEND-IDTBEG)-1
IDTB DD 0 ; filled in at runtime

; PSP segment address
_PSP DW 0

; video variables for the OUCH and related routines
CURSOR DD 0 ; cursor location
COLOR DB 7 ; display cursor

; temp vars for some non reentrant interrupt routines
STO1 DD 0
STO2 DD 0
STO3 DD 0
STO4 DD 0
SAV_DS DD 0
SAV_ES DD 0
SAV_GS DD 0
SAV_FS DD 0

BPON DB 0 ; Enables conditional breakpoints

; Debug Dump variables
DUMP_SEG DW 0 ; if zero don't dump memory
DUMP_OFF DD 0 ; Offset to start at
DUMP_CNT DD 0 ; # of bytes to dump

; Break & critical error handler variables
BREAKKEY DB 0 ; break key occurred
CRITICAL DB 0 ; critical error occurred
CRITAX DW 0 ; critical error ax
CRITDI DW 0 ; critical error di
CRITBP DW 0 ; critical error bp
CRITSI DW 0 ; critical error si

; Address of user's break handler
BREAK_HANDLE EQU THIS FWORD
BRK_OFF DD 0
BRK_SEG DW 0

; Address of user's critical error handler
CRIT_HANDLE EQU THIS FWORD

```

```

CRIT_OFF DD OFFSET DEF_CRIT
CRIT_SEG DW SEL_CODE32

; Message for default critical error handler
CRITMSG DB 'A critical error has occurred.',13,10
        DS '<A>bort, <R>etry, <F>ail? $'

; here is where vm86 int's stack up p10 esp's
INTSP DD $+PVSTACK+4
        DB PVSTACK DUP (0)

; Default VM86CALL parameter block
PINTFRAME VM86BLK <>

; interface block for critical error handler
CINTFRAME VM86BLK <>

; hardware interrupt vm86 block
HINTFRAME VM86BLK <>

; storage for the original PIC interrupt mask registers
INTMASK DB 0
INTMASKAT DB 0

DAT32END EQU $
DAT32 ENDS

;*****
; Begin 32 bit code segment

SEG32 SEGMENT PARA PUBLIC 'CODE32' USE32
        ASSUME CS:SEG32, DS:DAT32
PCODE PROC
SEG32BEG EQU $

; Start of protected mode code. We jump here from inside CODE16.INC
SEG32ENT: MOV AX,SEL_DATA ; 1st order of business:
        MOV DS,AX ; load up segment registers
        LSS ESP, FWORD PTR SLOAD
        MOV AX,SEL_VIDEO
        MOV ES,AX
        MOV AX,SEL_DATA0
        MOV FS,AX
        MOV AX,SEL_GDT
        MOV GS,AX

; set up IDT
        CALL32S MAKIDT

; reprogram pic(s)
        IN AL,21H
        MOV INTMASK,AL
        IF ATCLASS
        IN AL,0A1H
        MOV INTMASKAT,AL
        MOV AL,11H
        OUT 0A0H,AL
        OUT 20H,AL
        IDELAY
        MOV AL,28H
        OUT 0A1H,AL
        MOV AL,20H
        OUT 21H,AL
        IDELAY
        MOV AL,2
        OUT 0A1H,AL
        MOV AL,4
        OUT 21H,AL
        IDELAY
        MOV AL,1
        OUT 0A1H,AL
        OUT 21H,AL
        IDELAY
        MOV AL,INTMASKAT
        OUT 0A1H,AL
        MOV AL,INTMASK
        OUT 21H,AL
        ELSE
; INBOARD PC Code
        MOV AL,13H
        OUT 20H,AL
        MOV AL,20H
        OUT 21H,AL
        MOV AL,9
        OUT 21H,AL
        MOV AL,INTMASK
        OUT 21H,AL
        ENDIF
        STI ; enable interrupts

; *** Start user code with TSS (req'd for vm86 op's etc.)
        MOV AX,TSS0
        LTR AX
        JMPABS32 TSS1,0
PCODE ENDP

;*** 32 bit support routines
; This routine creates the required IDT. This is only a subroutine to keep
; from cluttering up the main code, since you aren't likely to call it again.
; Assumes that all ISR routines are of fixed length and in sequence. After
; makidt has built the table, you can still replace individual INT gates with
; your own gates (see make_gate)
MAKIDT PROC
        PUSH ES
        MOV AX,IDTABLE
        MOVZX EAX,AX
        SHL EAX,4
        ADD EAX,OFFSET IDTBEG
        MOV IDTB,EAX
        MOV AX,SEL_IDT
        MOV ES,AX
        XOR AL,AL

```


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```

; Make all interrupt gates DPL=3
MOV AH,INTR_GATE OR DPL3
MOV CX,SEL_ICODE
MOV EDX,OFFSET IDTBEG
XOR SI,SI
MOV EBX,OFFSET INTO
IDTLOOP: CALL32F SEL_CODE32,MAKE_GATE
ADD EBX,INT1-INT0
ADD SI,8
; loop form max # of interrupts
CMP SI,(TOPINT-1)*8
JB SHORT IDTLOOP
LIDT NEWIDT
POP ES
RET
MAKIDT ENDP

; This routine is just like the real mode make desc
; EBX=base ECX=limit AH=ARB AL=0 or 1 for 16 or 32 bit
; SI=selector (TI&RPL ignored) and ES:EDX is the table base address
MAKE_SEG PROC FAR
PUSH ESI
PUSH EAX
PUSH ECX
MOVZX ESI,SI
SHR SI,3 ; adjust to slot #
SHL AL,6 ; shift size to right bit position
CMP ECX,0FFFFFFH ; see if you need to set G bit
JLE OKLIM
SHR ECX,12 ; div by 4096
OR AL,80H ; set G bit
OKLIM: MOV ES:[EDX+ESI*8],CX
SHR ECX,16
OR CL,AL
MOV ES:[EDX+ESI*8+6],CL
MOV ES:[EDX+ESI*8+2],BX
SHR EBX,16
MOV ES:[EDX+ESI*8+4],BL
MOV ES:[EDX+ESI*8+5],AH
MOV ES:[EDX+ESI*8+7],BH
POP ECX
POP EAX
POP ESI
RET
MAKE_SEG ENDP

; This routine make gates -- AL=WC if applicable -- AH=ARB -- EBX=offset
; CX=selector -- ES:EDX=table base -- SI= selector (TI&RPL ignored)
MAKE_GATE PROC FAR
PUSH ESI
PUSH EBX
SHR SI,3
MOVZX ESI,SI
MOV ES:[EDX+ESI*8],BX
MOV ES:[EDX+ESI*8+2],CX
MOV ES:[EDX+ESI*8+4],AX
SHR EBX,16
MOV ES:[EDX+ESI*8+6],BX
POP EBX
POP ESI
RET
MAKE_GATE ENDP

; Routine to call BIOS/DOS. NOT REENTRANT (but so what? DOS isn't either)
CALL86 PROC FAR
PUSH DS
PUSH GS
PUSH FS
RETRY86: PUSHAD
PUSHFD
PUSH ES:[EBX+40] ; save new ebx
PUSH EBX
PUSH ES
INT 30H ; call PROT
PUSH SEL_DATA
POP DS
POP ES
XCHG EBX,[ESP]
POP ES:[EBX+40]
PUSHFD
CMP BREAKKEY,0 ; see if break occurred
JZ SHORT NOBRKCHECK
CMP BRK_SEG,0 ; see if user has brk handler
JZ SHORT NOBRKCHECK
; call user's break handler
MOV BREAKKEY,0
CALL FWORD PTR BREAK_HANDLE
NOBRKCHECK: CMP CRITICAL,0 ; see if critical error
JZ SHORT NOCRITCK
CMP CRIT_SEG,0 ; see if critical error handler
JZ SHORT NOCRITCK
; call critical error handler
PUSH EAX
XOR AL,AL
MOV CRITICAL,AL
CALL FWORD PTR CRIT_HANDLE
OR AL,AL ; AL=0? FAIL
JNZ SHORT RETRY?
POP EAX
POPFD
STC ; make sure carry is set
PUSHFD
JMP SHORT NOCRITCK
RETRY?: DEC AL ; AL=1? RETRY
JNZ SHORT CABORT

```

```

; To retry an error, we set up everything the way it was and
; redo the interrupt. This is cheating (a little), and may not
; work in every possible case, but it seems to work in all the cases tried.
POP EAX
POPFD
POP ES:[EBX+40]
POPFD
POPAD
JMP SHORT RETRY86
CABORT: POP EAX ; ABORT
POPFD
LEA ESP,[ESP+40] ; balance stack
MOV AL,7FH ; DOS error=7FH
BACK2DOS
NOCRITCK: POPFD
LEA ESP,[ESP+40] ; balance stack
PUSHFD
; see if segment save requested
CMP BYTE PTR ES:[EBX],0
JZ NOSEGS
; load parameter block from static save area
PUSH EAX
MOV EAX,SAV_FS
MOV ES:[EBX+28],EAX
MOV EAX,SAV_DS
MOV ES:[EBX+24],EAX
MOV EAX,SAV_ES
MOV ES:[EBX+20],EAX
MOV EAX,SAV_GS
MOV ES:[EBX+32],EAX
POP EAX
NOSEGS: POPFD
POP FS
POP GS
POP DS
MOV EBX,ES:[EBX+40]
RET
CALL86 ENDP

; Directly clear page 0 of the screen
CLS PROC FAR
PUSHFD
PUSH DS
PUSH ES
PUSH EDI
PUSH ECX
PUSH EAX
MOV CX,SEL_VIDEO
MOV ES,CX
MOV CX,SEL_DATA
MOV DS,CX
CLD
MOV EDI,0
MOV ECX,2000
MOV AX,0720H
REP STOSW
XOR ECX,ECX
MOV CURSOR,ECX
POP EAX
POP ECX
POP EDI
POP ES
POP DS
POPFD
RET
CLS ENDP

; Outputs message to screen -- ASCIIZ pointer in ds:ebx - modifies ebx
MESSOUT PROC FAR
PUSH EAX
MOV AL,[EBX]
NXT: INC EBX
OR AL,AL
JNZ SHORT SKIP
POP EAX
SKIP: CALL32F SEL_CODE32, OUCH
JMP SHORT NXT
MESSOUT ENDP

; Performs CR/LF sequence to screen using OUCH
CRLF PROC FAR
PUSH EAX
MOV AL,13
CALL32F SEL_CODE32, OUCH
MOV AL,10
CALL32F SEL_CODE32, OUCH
POP EAX
RET
CRLF ENDP

; Character and digit output routines
; hexout4 - print longword in EAX in hex
; hexout2 - print word in AX in hex
; hexout - print byte in AL in hex
; ouch - print ASCII character in AL
OUTPUT PROC FAR
; print longword in eax
HEXOUT4 LABEL FAR
PUSH EAX
SHR EAX,16
CALL32F SEL_CODE32,HEXOUT2
POP EAX
; print word in ax
HEXOUT2 LABEL FAR
PUSH EAX
MOV AL,AH

```




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```

CALL32F SEL_CODE32, HEXOUT
POP EAX
; print a hex byte in al
HEXOUT LABEL FAR
MOV BL,AL
AND AX,0F0H
SHL AX,4
MOV AL,BL
AND AL,0FH
ADD AX,'00'
MOV BL,AL
MOV AL,AH
CALL32F SEL_CODE32, HEX1DIG
MOV AL,BL
HEX1DIG: CMP AL,'9'
JBE SHORT HIDIG
ADD AL,'A'-'0'-0AH
HIDIG:
OUCH LABEL FAR
PUSH EDI
PUSH EAX
PUSH DS
PUSH ES
PUSH ECX
MOV CX,SEL_VIDEO
MOV ES,CX
MOV CX,SEL_DATA
MOV DS,CX
POP ECX
MOV AH,COLOR
MOV EDI,CURSOR
CMP EDI,2000 ; rolling off the screen?
JB NOSCROLL
; scroll screen if required
PUSH DS
PUSH ES
POP DS
PUSH ESI
PUSH ECX
PUSH EDI
CLD
MOV ECX,960
XOR EDI,EDI
MOV ESI,160
REP MOVSD
POP EDI
SUB EDI,80
POP ECX
POP ESI
POP DS
NOSCROLL: CMP AL,0DH
JZ SHORT CR
CMP AL,0AH
JZ SHORT LF
; write to screen
MOV ES:[EDI*2],AX
INC EDI
JMP SHORT OUCHD
CR: PUSH EDX
PUSH ECX
MOV EAX,EDI
XOR EDX,EDX
MOV ECX,80
DIV ECX
SUB EDI,EDX
POP ECX
POP EDX
JMP SHORT OUCHD
LF: ADD EDI,50H
OUCHD: MOV CURSOR,EDI ; update cursor
POP ES
POP DS
POP EAX
POP EDI
RET
ENDP
OUTPUT
; Default critical error handler
DEF_CRIT PROC FAR
PUSH ES
PUSH EBX
PUSH EDX
MOV BX,SEL_DATA
MOV ES,BX
ASSUME DS:NOTHING, ES:DAT32
; load critical error handler's private stack
MOV BX,CSTACK
MOV CINTFRAME.VMSS,EBX
MOV EBX,OFFSET CSTACK
MOV CINTFRAME.VMES,EBX
MOV BX,DAT32
MOV CINTFRAME.VMDS,EBX
MOV BX,21H
MOV CINTFRAME.VMINT,EBX
MOV EBX,OFFSET CINTFRAME
MOV EDX,OFFSET CRITMSG
MOV AH,9
PUSH EBX
VM86CALL EBX ; print message
POP EBX
CLOOP: MOV AH,7
PUSH EBX
VM86CALL EBX ; get keystroke
POP EBX
; ignore function keys
OR AL,AL
JZ SHORT CRITFNKEY
MOV AH,AL
OR AL,20H ; convert to lower case
CMP AL,'a'

```

```

JNZ SHORT CFAIL?
MOV AL,2
JMP SHORT CREXIT
CFAIL?: CMP AL,'f'
JNZ SHORT CRETRY?
XOR AL,AL
JMP SHORT CREXIT
CRETRY?: CMP AL,'r'
MOV AL,1
JNZ SHORT CRITBAD
CREXIT: MOV DL,AH ; echo letter + CRLF
MOV AH,2
PUSH EAX
PUSH EBX
VM86CALL EBX
POP EBX
MOV AH,2
MOV DL,0DH
PUSH EBX
VM86CALL EBX
POP EBX
MOV AH,2
MOV DL,0AH
VM86CALL EBX
POP EAX
POP EDX
POP EBX
POP ES
RET
CRITFNKEY: MOV AH,7
PUSH EBX
VM86CALL EBX ; ignore fn key/alt-key
POP EBX
CRITBAD: MOV DL,7
MOV AH,2
PUSH EBX
VM86CALL EBX ; unknown input - ring bell
POP EBX
JMP SHORT CLOOP
DEF_CRIT ENDP
SEG32END EQU $
SEG32 ENDS
;*****
; user program - PROT includes the file defined by the variable PROGRAM.
; convoluted method to make MASM take a string equate for an include filename
TEMPINCLUDE MACRO FN ; ; temporary macro
INCLUDE &FN%.PM
ENDM
TEMPINCLUDE %PROGRAM
PURGE TEMPINCLUDE ; delete macro
; task state segments
INCLUDE TSS.INC
; 16 bit code (DOS entry/exit)
INCLUDE CODE16.INC
; Segment to determine the last memory address
ZZZSEG SEGMENT PARA PUBLIC 'ZZZ' USE16
ZZZSEG ENDS
ELSE
IFZ
%OUT You must specify a program title
%OUT use: MASM /DPROGRAM=FILENAME PROT.ASM...
ENDIF
.ERR
ENDIF
END ENTRY

```

Listing Two

```

;*****
; * PROT - A 386 protected mode DOS extender
; * Copyright (C) 1989, by Al Williams -- All rights reserved.
; * Permission is granted for non-commercial use of this software
; * subject to certain conditions (see PROT.ASM).
; * This file is: GDT.INC, the Global Descriptor Table definitions.
;*****
; See EQU.MAC.INC for an explanation of the DESC macro
GDTSEG SEGMENT PARA PUBLIC 'CODE32' USE32
GDT EQU $ ; GDT space
DESC SEL_NULL ; DUMMY NULL SELECTOR
DESC SEL_CODE16 ; 16 BIT CODE SEGMENT
DESC SEL_DATA0 ; 4GB SEGMENT
DESC SEL_CODE32 ; 32 BIT CODE SEGMENT
DESC SEL_STACK ; 32 BIT STACK
DESC SEL_RDATA ; REAL MODE LIKE DATA SEG
DESC SEL_GDT ; GDT ALIAS

```

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```

DESC    SEL_VIDEO    ; VIDEO MEMORY
DESC    SEL_DATA     ; 32 BIT DATA
DESC    SEL_IDT      ; IDT ALIAS
DESC    SEL_ICODE     ; ISR SEGMENT
DESC    SEL_TSS0     ; DUMMY TASK BLOCK
DESC    TSS0         ; SAME (MUST FOLLOW SEL_TSS0)
DESC    SEL_TSS1     ; MAIN TASK BLOCK
DESC    TSS1         ; SAME (MUST FOLLOW SEL_TSS1)
DESC    SEL_UCODE     ; USER CODE
DESC    SEL_UDATA     ; USER DATA
DESC    SEL_PSP       ; DOS PSP
DESC    SEL_FREE      ; FREE DOS MEMORY
DESC    SEL_EXT       ; EXTENDED MEMORY
DESC    SEL_ENV       ; ENVIROMENT

GDTEND  = $
GDTSEG  ENDS

```

Listing Three

```

;*****
; * PROT - A 386 protected mode DOS extender
; * Copyright (C) 1989, by Al Williams -- All rights reserved.
; * Permission is granted for non-commercial use of this software
; * subject to certain conditions (see PROT.ASM).
; * This file is: EQUIMAC.INC, assorted macros and equates.
;*****
; Equates the user may wish to change
ATCLASS EQU 1 ; 1=AT/386 0=INBOARD 386/PC
DOSSTACK EQU 200H ; stack size for DOS startup
VM86STACK EQU 200H ; stack size for VM86 int calls
CRITSTACK EQU 30H ; stack size for crit err handler
PMSTACK EQU 1000H ; stack size for p-mode stack
PVSTACK EQU 260 ; p10/vm86 psuedo stack size
; Maximum protected mode interrupt # defined
TOPINT EQU 30H
; The critical error handler works different for DOS 2.X than for other DOS
; versions. In 99% of the cases it won't make any difference if you compile
; with DOS=2.... major dos version number (2, 3 or 4)
DOS EQU 3

; parameter block to interface for int 30H (call86 & VM86CALL)
VM86BLK STRUC
VMSEGLFLAG DD 0 ; restore segment registers (flag)
VMINT DD 0 ; interrupt number
VMFLAGS DD 0 ; EFLAGS
VMESP DD 0 ; ESP
VMSS DD 0 ; SS
VMES DD 0 ; ES
VMDS DD 0 ; DS
VMFS DD 0 ; FS
VMGS DD 0 ; GS
VMEBP DD 0 ; EBP
VMEBX DD 0 ; EBX
VM86BLK ENDS

; Access rights equates. Use these with make_desc or make_seg
RO_DATA EQU 90H ; r/o data
RW_DATA EQU 92H ; r/w data
RO_STK EQU 94H ; r/o stack
RW_STK EQU 96H ; r/w stack
EX_CODE EQU 98H ; exec only code
ER_CODE EQU 9AH ; read/exec code
CN_CODE EQU 9CH ; exec only conforming code
CR_CODE EQU 9EH ; read/exec conforming code
LDT_DESC EQU 82H ; LDT entry
TSS_DESC EQU 89H ; TSS entry

; use these with make_gate
CALL_GATE EQU 8CH ; call gate
TRAP_GATE EQU 8FH ; trap gate
INTR_GATE EQU 8EH ; int gate
TASK_GATE EQU 85H ; task gate

; dpl equates
DPL0 EQU 0
DPL1 EQU 20H
DPL2 EQU 40H
DPL3 EQU 60H

; macro definitions

; other macros use this to error check parameters
; Give an error if last is blank or toomany is not blank
ERRCHK MACRO LAST,TOOMANY
IFNB <TOOMANY>
IF2
%OUT Too many parameters
ENDIF
.ERR
ENDIF
IFB <LAST>
IF2
%OUT Not enough parameters
ENDIF
.ERR
ENDIF
ENDM

; Perform absolute 16 bit jump (in a 16 bit segment)
JMPABS MACRO A,B,ERRCK
ERRCHK B,ERRCK
DB 0EAH ; absolute 16 bit jump
DD OFFSET B
DW
ENDM

```

```

DW A
ENDM

; Perform absolute 32 bit jump (in a 32 bit segment)
JMPABS32 MACRO A,B,ERRCK
ERRCHK B,ERRCK
DB 0EAH ; absolute 32 bit jump
DD OFFSET B
DW A
ENDM

; this generates a correct 32 bit offset for a proc call
; since MASM doesn't sign extend 32 bit relative items
CALL32S MACRO LBL,ERRCK ; ; short call
ERRCHK LBL,ERRCK
DB 0E8H
DD LBL-($+4)
ENDM

CALL32F MACRO SG,LBL,ERRCK ; ; far call
ERRCHK LBL,ERRCK
DB 9AH
DD OFFSET LBL
DW SG
ENDM

JMP32S MACRO LBL,ERRCK ; ; short jump
ERRCHK LBL,ERRCK
DB 0E9H
DD LBL-($+4)
ENDM

; conditional jump macro
; jcc32 uses condition codes used in Intel literature
JCC32 MACRO CONDX,LBL,ERRCK
ERRCHK LBL,ERRCK
DB 0FH
IFIDNI <CONDX>,<A>
DB 87H
ELSEIFIDNI <CONDX>,<NB>
DB 87H
ELSEIFIDNI <CONDX>,<AE>
DB 83H
ELSEIFIDNI <CONDX>,<C>
DB 82H
ELSEIFIDNI <CONDX>,<NAE>
DB 82H
ELSEIFIDNI <CONDX>,<B>
DB 82H
ELSEIFIDNI <CONDX>,<BE>
DB 86H
ELSEIFIDNI <CONDX>,<E>
DB 84H

ELSEIFIDNI <CONDX>,<Z>
DB 84H
ELSEIFIDNI <CONDX>,<G>
DB 8FH
ELSEIFIDNI <CONDX>,<GE>
DB 8DH
ELSEIFIDNI <CONDX>,<L>
DB 8CH
ELSEIFIDNI <CONDX>,<LE>
DB 8EH
ELSEIFIDNI <CONDX>,<NA>
DB 86H
ELSEIFIDNI <CONDX>,<NB>
DB 83H
ELSEIFIDNI <CONDX>,<NC>
DB 83H
ELSEIFIDNI <CONDX>,<NGE>
DB 8CH
ELSEIFIDNI <CONDX>,<NL>
DB 8DH
ELSEIFIDNI <CONDX>,<NO>
DB 81H
ELSEIFIDNI <CONDX>,<NP>
DB 8BH
ELSEIFIDNI <CONDX>,<NS>
DB 89H
ELSEIFIDNI <CONDX>,<NZ>
DB 85H
ELSEIFIDNI <CONDX>,<O>
DB 80H
ELSEIFIDNI <CONDX>,<P>
DB 8AH
ELSEIFIDNI <CONDX>,<PE>
DB 8AH
ELSEIFIDNI <CONDX>,<PO>
DB 8BH
ELSEIFIDNI <CONDX>,<S>
DB 88H

ELSE
%OUT JCC32: Unknown condition code
.ERR
ENDIF
DD LBL-($+4)
ENDM

; Override default operand size
OPSI2 MACRO NOPARM ; ; op size override
ERRCHK X,NOPARM
DB 66H
ENDM

; Override default address size
ADSI2 MACRO NOPARM ; ; address size override
ERRCHK X,NOPARM

```



```

        DB      67H
        ENDM
; delay macro for interrupt controller access
IDELAY  MACRO   NOPARM
        LOCAL  DELAY1,DELAY2
        ERRCHK X,NOPARM
        JMP    SHORT DELAY1
DELAY1:  JMP    SHORT DELAY2
DELAY2:
        ENDM

; BREAKPOINT MACROS

; MACRO to turn on NBREAKPOINTS. If used with no arguments (or a 1), this
; macro makes NBREAKPOINT active if used with an argument > 1, NBREAKPOINT
; will break after that many passes
BREAKON MACRO   ARG,ERRCK
        ERRCHK X,ERRCK
        PUSH  DS
        PUSH  SEL_DATA
        POP   DS
        PUSH  EAX
        IFB   <ARG>
        MOV   AL,1
        ELSE
        MOV   AL,&ARG
        ENDIF
        MOV   BPON,AL
        POP   EAX
        POP   DS
        ENDM

; Turns off NBREAKPOINT
BREAKOFF MACRO  NOPARAM
        ERRCHK X,NOPARAM
        PUSH  DS
        PUSH  SEL_DATA
        POP   DS
        PUSH  EAX
        XOR   AL,AL
        MOV   BPON,AL
        POP   EAX
        POP   DS
        ENDM

BREAKPOINT MACRO  NOPARM
        ERRCHK X,NOPARM
        INT    3
        ENDM

; Counter breakpoint - use BREAKON to set count control

; BREAKPOINT with memory dump.
; usage: BREAKDUMP seg selector, offset, number_of_words
BREAKDUMP MACRO  SEG,OFF,CNT,ERRCK
        ERRCHK CNT,ERRCK
        PUSH  EAX
        PUSH  DS
        MOV   AX,SEL_DATA
        MOV   DS,AX
        MOV   AX,&SEG
        MOV   DUMP_SEG,AX
        MOV   EAX,OFFSET &OFF
        MOV   DUMP_OFF,EAX
        MOV   EAX,&CNT
        MOV   DUMP_CNT,EAX
        POP   DS
        POP   EAX
        BREAKPOINT
        ENDM

NBREAKDUMP MACRO  SEG,OFF,CNT,ERRCK
        ERRCHK CNT,ERRCK
        LOCAL NONBP
        PUSH  DS
        PUSH  SEL_DATA
        POP   DS
        PUSHFD
        OR     BPON,0
        JZ     NONBP
        DEC    BPON
        JNZ    NONBP
        POPFD
        POP    DS
        BREAKDUMP SEG,OFF,CNT
        NONBP:
        POPFD
        POP    DS
        ENDM

; determine linear address of first free byte of memory (to nearest paragraph)
LOADFREE MACRO  REG,ERRCK
        ERRCHK REG,ERRCK
        XOR    E&REG,E&REG
        MOV    &REG,SEG ZZZGROUP
        SHL    E&REG,4
        ENDM

; Set up PINTFRAME (uses eax). Loads vmstack & vmdata to the ss:esp and
; ds slots in pintframe -- default ss:esp=ssint1 -- default ds=userdata
PROT_STARTUP MACRO  VMSTACK,VMDATA,ERRCK
        ERRCHK X,ERRCK
        IFB     <VMSTACK>
        MOV     AX,SEG SSINT1
        ELSE
        MOV     AX,SEG VMSTACK
        ENDIF
        MOV     PINTFRAME.VMSS,EAX
        IFB     <VMDATA>
        MOV     EAX,OFFSET SSINT1
        ELSE
        MOV     EAX,OFFSET VMSTACK

```

```

        ENDIF
        MOV     PINTFRAME.VMESP,EAX
        IFB     <VMDATA>
        MOV     AX,SEG USERDATA
        ELSE
        MOV     AX,SEG VMDATA
        ENDIF
        MOV     PINTFRAME.VMDS,EAX
        ENDM

; start PROT user segments
PROT_CODE MACRO  NOPARM
        ERRCHK X,NOPARM
USERCODE  SEGMENT PARA PUBLIC 'CODE32' USE32
USERCODEBEG EQU   $
        ASSUME  CS:USERCODE, DS:USERDATA, ES:DAT32
        ENDM

PROT_DATA MACRO  NOPARM
        ERRCHK X,NOPARM
USERDATA  SEGMENT PARA PUBLIC 'DATA32' USE32
USERDATAEND EQU  $
        ENDM

PROT_CODE_END MACRO  NOPARM
        ERRCHK X,NOPARM
USERCODEEND EQU  $
        ENDS
        ENDM

PROT_DATA_END MACRO  NOPARM
        ERRCHK X,NOPARM
USERDATAEND EQU  $
        ENDS
        ENDM

; Simplify programs with no data segment
NODATA  MACRO  NOPARM
        ERRCHK X,NOPARM
        PROT_DATA
        PROT_DATA_END
        ENDM

; Mnemonic for call86 call
VM86CALL MACRO  NOPARM
        ERRCHK X,NOPARM
        CALL32F SEL_CODE32,CALL86
        ENDM

; Mnemonic for dos return
BACK2DOS MACRO  RC,ERRCK
        ERRCHK X,ERRCK
        IFNB   <RC>
        MOV    AL,RC
        ENDIF
        JMPABS32 SEL_CODE16,BACK16
        ENDM

; Variables and macro to create GDT/LDT/IDT entries
C_GDT = 0
C_LDT = 0
C_IDT = 0

; create "next" descriptor with name in table. If no table specified, use GDT
DESC  MACRO  NAME,TABLE,ERRCK
        DQ    0
        IFB   <TABLE>
        NAME  = C_GDT
        ELSE
        NAME  = C_GDT+8
        IFIDNI <TABLE>,<LDT>
        ; For LDT selectors, set the TI bit to one
        NAME  = C_&TABLE OR 4
        ELSE
        NAME  = C_&TABLE
        ENDIF
        C_&TABLE = C_&TABLE+8
        ENDF
        ENDM

```

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Routine	Purpose
CLS	Clears page 0 of the video display directly.
OUCH	Prints the character in AL to page 0 of the video display using direct video access.
CRLF	Performs a carriage return/line feed using the OUCH routine.
MESSOUT	Prints the zero-terminated string pointed to by DS:EDX using OUCH. Modifies EBX.
HEXOUT	Outputs the bytes in AL in hex using OUCH.
HEXOUT2	Outputs the word in AX in hex using OUCH.
HEXOUT4	Outputs the double word in EAX in hex using OUCH.
MAKE_GATE	Makes a task gate, trap gate, interrupt gate or call gate. Call this routine with ES:EDX pointing to the table's (GDT, LDT or IDT) base address (as a read/write segment). Set CX to the target descriptor, EBX to the target offset (if applicable), SI to the selector for the gate, AH to one of the access right bytes (ARB) defined in EQU MAC.INC (Listing 2), and AL to the word count (for call gates only).
MAKE_SEG	Makes a segment descriptor. Call this routine with ES:EDX pointing to the GDT or LDT table base address (as a read/write data segment). EBX is the base address of the segment, ECX is the limit (in bytes), AL is 0 for a 16-bit segment or 1 for a 32-bit segment, and AH is one of the access rights bytes (ARB) defined in EQU MAC.INC.

Table 3 PROT's programmer callable routines

value is in *critax*; the DI, BP and SI values are in *critdi*, *critbp* and *critsi*, respectively. Your error handler must return a value in AL that determines the action to take. If AL is 0, PROT will fail the error. If it is 1, PROT retries the error. And if AL is equal to 2, PROT will abort to DOS. If you choose to abort the program due to a critical error, PROT returns a 7FH to DOS.

Two DOS interrupts, INT 25H and 26H, do not properly return to their callers. They normally leave the caller's flags on the stack when returning. When programming with PROT in protected mode, these flags do not remain on the stack. The same effect can be obtained with the code shown in Example 3. However, this is not a problem when running programs in virtual-86 mode; only in protected mode. Of course, if you don't need the old flags — and you usually won't — you don't need to worry.

PROT uses several routines that may also be useful to the applications programmer, as shown in Table 3. Your programs can call these routines via a far call (the *CALL32F* macro).

Putting it together

After creating a source file and setting any equates that you want to change at the top of EQU MAC.INC, you can compile a PROT application by using the batch file shown in Fig 2. The resulting EXE file will execute from the DOS prompt. If PROT does not find a 386 or 486, it will exit with an error message and return 80H to DOS. PROT will also exit with an 80H to DOS if another program already has the computer in protected mode.

I've included two short sample programs to illustrate PROT programming and a protected-mode file browser, FBROWSE.PM. Due to space limitations, however, these programs are not included in this issue, but are available for downloading from APC MAGNET, or by sending a blank, formatted 360K 5.25in disk with a stamped, self-addressed package to: FBROWSE, APC, 122 Ormond Road, Elwood 3184.

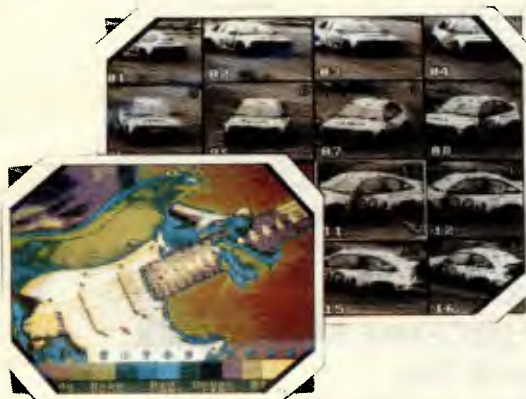
That's it for this issue. Next month I'll dive into debugging, 386 exceptions, and take a more in-depth look at PROT itself.

END

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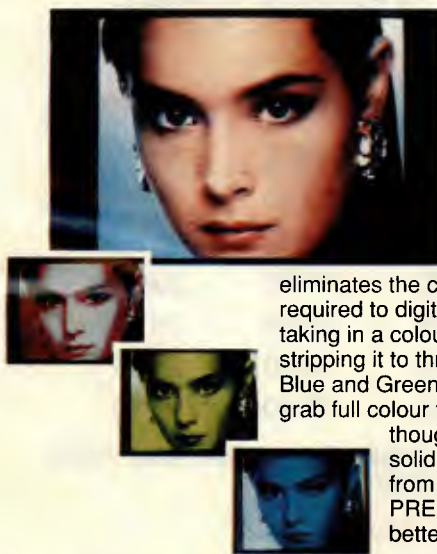
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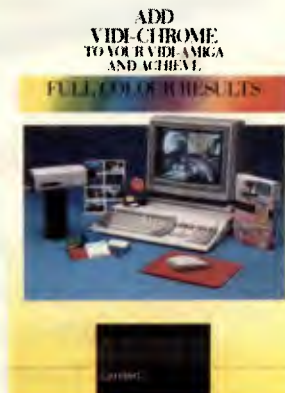
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Handling duplicate records

It's easy to add duplicate records to a dBASE III Plus database, since dBASE III Plus does not automatically check for them. And once inserted, duplicates can be difficult to find and remove.

Program 1 in Fig 1 will report duplicate values based on a database name and field name (or expression) that you specify. If the entire record is a duplicate, it reports the record number as well as the duplicate value. Note that the values for the field expression are expanded using the macro operator. Therefore, your field expression can include numeric, string or date calculations, as well as functions that operate on multiple fields.

If you want to eliminate the duplicates on the spot, just replace the IF block with

```
IF .NOT. EOF() .AND. oldval = &fld
    BROWSE
    GOTO oldrec
ENDIF
```

This will put you in the dBASE multi-record BROWSE mode and place the cursor on the duplicate record. Then the command GOTO oldrec will put you back into the search where you left off, just in case you modified the index value.

D Moe

There are two problems that need to be solved regarding duplicates, and every dBASE programmer sooner or later encounters both. The first, addressed by Program 1 in Fig 1, is how to detect duplicates that already exist in a database. The second, hopefully learned early in a dBASE programmer's career, is how to prevent duplicates from being entered into the database to begin with.

If you've happened upon a database that already contains duplicates, the first step in locating them is to find out what field or expression determines duplication. If the records are indexed on a unique field, then that field is a likely candidate. For example, if an employee database is keyed on a tax number, then this is the obvious choice.

But the tax number may not be enough. For example, what if the wrong number were accidentally entered, and that tax number happened to be unique in the database? In this case, there could already be an entry with the right tax number, resulting in duplication.

The choices are even less clear if the database does not have an obvious field, such as a unique key field, to check. For example, a typical database of names

may include fields such as first name, surname name and middle initial. Searching by first name would certainly result in a long list of potential duplicates. But since many people have the same first name, this isn't a very efficient way to find duplicate records. Similarly, if you base your search on surname, you'll likely find more than one 'Smith' or 'Jones' that are valid singular identities.

So how can you identify duplicates?

DETECTING DUPLICATES IN dBASE III PLUS

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```
*****
* PROGRAM 1 *
*****

? "Duplicate Record Key Checker"
ACCEPT "Enter database name " TO dbn
USE &dbn
ACCEPT "Enter field name " TO fld
INDEX ON &fld TO tempndx
DO WHILE .NOT. EOF()
    oldval = &fld
    oldrec = recno()
    SKIP
    IF .NOT.EOF() .AND. oldval = &fld
        ? " Record " + LTRIM(STR(recno()))
        ?? " Matches " + LTRIM(STR(oldrec))
        ?? " Value = "
        ?? &fld
    ENDIF
ENDDO
? "DONE. "
```

```
****
* PROGRAM 2 *
****

SET ECHO OFF
SET TALK OFF
? "Duplicate Record Key Checker"
ACCEPT "Enter database name: " TO dbn
USE &dbn
DISP STRU
ACCEPT "Enter field name: " TO fld
INDEX ON &fld TO tempndx
DO WHILE .NOT. EOF()
    oldval = &fld
    oldrec = recno()
    SKIP
    IF .NOT. EOF() .AND. oldval = &fld
        SKIP -1
        DISPLAY &fld WHILE .NOT. EOF() .AND. oldval = &fld
    ENDIF
ENDDO
```

```
%% Input database name.
%% Open database.
%% Input name of field
%% Index database on field.
%% Search through database.
%% Save field value.
%% Save record number.
%% Skip to next record.
%% Compare the field values.
%% Print message if the same
%% Print record numbers

%% Print duplicate value

%% Repeat until end file

%% Input data base name.
%% Open data base.
%% Display db structure
%% Input name of field
%% Index data base on field.
%% Search through data base.
%% Save field value.
%% Save record number.
%% Skip to next record.

%% Backup to first
%% Disp em

%% Repeat until end file
```

Fig 1 Given a database name and field name (or expression), Program 1 (top) reports duplicate values. If it finds a duplicate record, it reports the record number as well as the value. Program 2 displays the fields you can use in an expression and displays duplicates in a more readable format

PREVENTING DUPLICATES IN DBASE III PLUS

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```

PROCEDURE Addempl
*
* Demonstrate general logic for checking for duplicate
* keys. Abbreviated version, for illustration
* only, dBASE III Plus tested.
*
adrecno = RECNO()          && Save current recno
DO WHILE .T.
  STORE SPACE(11) TO M_tn   && Create blank memvars
  STORE SPACE(25) TO M_name
  STORE SPACE(40) TO M_address
  STORE SPACE(20) TO M_city
  STORE SPACE(2) TO M_state
  STORE SPACE(10) TO M_postcode
  READ
  IF READKEY() = 12         && Display entry screen
    && ESC means cancel
  EXIT
ENDIF
SEEK M_tn                  && Check for tn duplicate
IF FOUND()
  @ 8,0 SAY '      Record with that key already exists. Try again.'
  @ 9,0 SAY '      Press any key to continue.'
  WAIT ""
  GOTO adrecno
LOOP
ELSE
  APPEND BLANK              && No dups, ok to add
  REPLACE TN WITH M_TN      && Replace fields with memvars
  REPLACE NAME WITH M_NAME
  REPLACE ADDRESS WITH M_ADDRESS
  REPLACE CITY WITH M_CITY
  REPLACE STATE WITH M_STATE
  REPLACE POSTCODE WITH M_POSTCODE
  adrecno = RECNO()        && New record number
  EXIT
ENDIF
ENDDO
GOTO adrecno
RETURN

```

```

PROCEDURE editempl
*
* Demonstrate general logic for checking for duplicate
* keys. Abbreviated version, for illustration
* only, dBASE III Plus tested.
*
STORE RECNO() TO edrecno   && Save current position
DO WHILE .T.
  STORE tn TO M_tn         && Create memvars from record
  STORE name TO M_name
  STORE address TO M_address
  STORE city TO M_city
  STORE state TO M_state
  STORE postcode TO M_postcode
  READ
  IF READKEY() = 12         && Display entry screen
    && ESC means cancel
  EXIT
ENDIF
IF M_tn # tn                && If it's been changed
  SEEK M_tn                 && Check for tn duplicate
  IF FOUND()
    GOTO edrecno            && Restore position after seek
    @ 8,0 SAY '      Record with that key already exists. Try again.'
    @ 9,0 SAY '      Press any key to continue.'
  WAIT ""
  LOOP
ENDIF
REPLACE TN WITH M_TN        && Replace fields with memvars
REPLACE NAME WITH M_NAME
REPLACE ADDRESS WITH M_ADDRESS
REPLACE CITY WITH M_CITY
REPLACE STATE WITH M_STATE
REPLACE POSTCODE WITH M_POSTCODE
EXIT
ENDDO
GOTO edrecno                && Restore position after seek
RETURN

```

Fig 2 Before a new record is added or an existing record updated, these two routines will search a database keyed on social security number and verify that the tax number about to be entered does not duplicate an existing tax number

The general approach has to be analogous to a search-and-destroy mission, except that our intent is to search out candidates and examine them (not necessarily destroy them). You must start by identifying each and every expression that will be helpful in identifying duplicate candidates.

For example, consider a hypothetical employee database that contains tax number, name, address, city and state. The database is keyed on tax number.

Searching for duplicates based on the tax number would identify good candidates, since duplicate tax number's are not allowed. Searching for records where the contents of the name, address, city and state fields match would also identify strong candidates. (It's unlikely, but possible, that such a match would be valid.) A third search might also be made on the complete name. This may produce some valid entries with the same name (that is, 'Smith, John'), but will aid in locating candidates.

The three expressions, therefore, are

- TAX NUMBER
- NAME+ADDRESS+CITY+STATE
- NAME

If case matters, you might use UPPER with the second and third expressions. And you'd probably include LTRIM and TRIM for each of the fields too.

Now, for each expression, create an

INDEX using the expression, make sure the database is using the index, and search for duplicates by comparing consecutive records based upon the expression. (Note: the expressions have to be valid for use with the

INDEX ON expression TO index file

in your dBASE implementation.)

When you use a database with an index, the database appears to be sorted by the index expression. This means that if there are any duplicates for that expression, they will appear to be consecutive in the database file and can be accessed by SKIP. For example, if the database is INDEXED on tax number, the records will appear to be sorted in ascending order by tax number. So if there are two with the same tax number, they'll appear together, back to back. Therefore, for any tax number, you can check for duplicates just by looking at the next record's tax number.

Which brings us back to Program 1 in Fig 1. Mr Moe's submission uses this technique and is a handy way of identifying duplicates. It also allows the entry of a complex expression. Using our earlier example, you would run the program in Fig 1 once for each of our three expressions.

A slightly modified version, Program 2, also appears in Fig 1 (bottom). Here, a DISPLAY STRUCTURE command is used to display all the fields you can use to construct the expression. Furthermore, the DISPLAY command will display the duplicates in a slightly more readable format.

You might notice that we haven't addressed removing the duplicates once they're discovered. You may be tempted to try to automate this process, automatically deleting records that appear to be duplicates. Resist temptation. The safest way to identify duplicates is to present a report of candidates to a person who is qualified to examine the list and verify duplicates.

Any attempt to automatically remove duplicates will undoubtedly result in records being deleted that are not true duplicates, but just plain and simple data entry errors.

One alternative, suggested by Mr Moe, is to substitute a BROWSE command which, in Program 2 (Fig 1), would replace the DISPLAY command. In this way the data entry person will be able to massage the database interactively as duplicate candidates are identified (assuming this person has the ability to verify true duplicates).

All of the above is fine for finding and removing duplicates that already exist, but a well-designed system should work hard to prevent their entry to begin with. So the question that still remains is, how do you prevent duplicates from being entered in the first place?

The answer lies in building some defensive programming techniques into your applications.

In our hypothetical employee database, only one record should exist for each tax number. To prevent duplicate keys from being entered, we must check for the existence of a record with

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that tax number before adding the new record. Similarly, if the user changes the tax number during editing, we must check for existence of the new tax number before allowing the database to be updated.

Fig 2 illustrates two example routines to add and edit records respectively to our employee database. A sample program that uses these routines with a sample database is available for downloading from APC MAGNET. If your dBASE implementation supports user-defined functions and the VALID clause for @SAY..GET, you can consider moving the

duplicate checking into a UDF for testing with VALID. This is especially valuable if you're editing 'directly' into the database via EDIT or APPEND and a format file, as opposed to using memory variables and the REPLACE command.

If your database does not have a unique key — and even if it does — you can help prevent duplicates by scanning the database for 'similar' entries prior to allowing updates. This could be accomplished by searching on a partial key, partial field value, or by using a SOUNDEx() function or similar function to identify values that sound alike — TN.



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Incremental steps in Excel macros

When Microsoft Excel encounters the instruction

=STEP()

in a macro, it displays the next macro instruction in a dialogue box and allows you to Step, Continue or Halt macro execution. The default choice is Step, so if you press Enter, the macro proceeds to the next command. Execution continues one step at a time until you press Continue or Halt.

What the Excel manuals don't tell you is that if you press Shift together with Enter, Excel successively evaluates each argument of the current command and displays the results in the dialogue box. Each time you press Shift-Enter, Excel performs another evaluation; it doesn't move on to the new macro command until you've seen all the results of the current command. New commands are always displayed in normal typeface and evaluated results are displayed in italics.

I have found this technique extremely helpful. It lets me see exactly where within a macro statement a problem is occurring.

J Abrams

This incremental step mode does indeed appear to be an undocumented feature of Excel. To get a feeling for how it works, run the macro shown in Fig 3.

When you execute this macro, Excel immediately encounters =STEP() in A2 and presents the Single Step dialogue box. The instruction displayed in the dialogue box is the first one after STEP — in this case the statement

Index=1000

Note that this instruction appears in normal roman characters in the dialogue box.

INCREMENTAL STEPS IN EXCEL MACROS

```

A
1 Abrams
2 =STEP()
3 Index=1000
4 index=index/2
5 =IF(index>300,GOTO(A4),BEEP())
6 =RETURN()
  
```

Fig 3 This short sample macro will be used to illustrate the Shift-Enter feature in Excel's STEP formula. Execute this key combination to display the results of macro statements

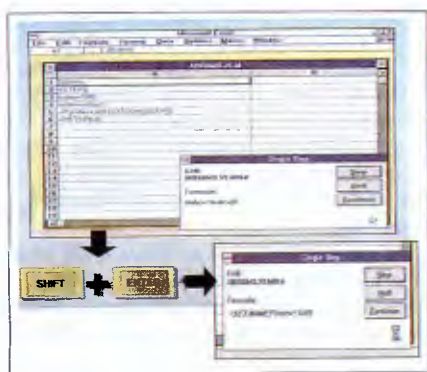


Fig 4 When stepping through any Excel macro, hit Shift-Enter. The dialogue box (inset) will display instructions and arguments

Now press Shift-Enter to take your first incremental step. The dialogue box responds by displaying — in italics — a modified form of the instruction at A3:

```
=SET.NAME ("Index", 1000)
```

This SET.NAME function is simply another form of the instruction that appears in our macro. Excel lets you assign a value to a variable with a statement of the form

```
name=value
```

but it uses the SET.NAME function to record the assignment. So the first incremental step simply converts the instruction in A3 to the format that Excel prefers.

Press Shift-Enter again and Excel's dialogue box displays

```
TRUE
```

After carrying out the instruction in A3, the SET.NAME function will return the message TRUE, which indicates (in effect) 'mission accomplished'. Most macro functions that cause Excel to take a particular action return TRUE after they've been executed. You can verify this by using the Display command on the Options menu to remove the Formula display of your macro text. Before you run a macro for the first time, you'll find that most of your action functions will return FALSE; afterwards, they'll say TRUE.

The next time you hit Shift-Enter, it takes Excel to the instruction at A4. This instruction

```
index=index/2
```

appears in the dialogue box in roman characters. Press the Shift-Enter combination again; Excel redisplay the instruction in italic, converts it to the SET.NAME format and calculates the

term on the right side of the equals sign. The final result displayed is

```
=SET.NAME ("index", 500)
```

On your next Shift-Enter, the display changes to **TRUE**, again indicating that our request was carried out successfully. Fig 4 shows the instruction at A4 and the first Shift-Enter result.

When you press Shift-Enter again, Excel moves on to the instruction at A5 and displays its text

```
=IF (index>300, GOTO (A4), BEEP ())
```

in roman characters. Now, when you take your next incremental step, you will arrive at the following statement:

```
=IF (GOTO ($A$4), BEEP ())
```

Here, Excel has converted the address A4 into an absolute-cell specification, which presents no mystery. But it has also evaluated the term,

```
index>300
```

found it to be TRUE, and compressed the IF function to the rather peculiar form

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MV.BAS

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```

1  'MV.BAS W.E.Davis 19890809
10  ON ERROR GOTO 60000
20  PRINT : INPUT "Old filename"; F1$: IF F1$ = "" THEN END
30  INPUT "New filename"; F2$: IF F2$ = "" THEN END
40  IF INSTR(F1$+F2$,"*") THEN BEEP: PRINT "Cannot contain *": GOTO 20
50  IF INSTR(F1$+F2$,"?") THEN BEEP: PRINT "Cannot contain ?": GOTO 20
60  IF INSTR(F1$+F2$,":") THEN BEEP: PRINT "Cannot contain ": GOTO 20
65  IF RIGHT$(F2$,1)="\\" THEN F2$=F2$+F1$
70  NAME F1$ AS F2$: PRINT F1$; " moved to "; F2$
80  GOTO 20
60000 IF ERR = 53 THEN BEEP: PRINT F1$; " does not exist": RESUME 20
60010 IF ERR = 58 THEN BEEP: PRINT "Cannot create "; F2$: RESUME 20
60020 ON ERROR GOTO 0

```



Fig 5 This little Basic program can 'move' a file about on a disk, either to a new directory, a new name or both. It performs these functions without copying and deleting the file's contents

shown above. Like the conversion we saw earlier (of **name=value** to the corresponding **SET.NAME** function), this metamorphosis just reflects the way Excel processes IF statements internally while executing our macros. There is one important thing to note when you're incrementally stepping through a macro: functions in which the **logical test** argument proves true will appear in the Single Step dialogue box with both the **value if true** and **value if false** arguments (unless, of course, you haven't provided a **value if false** argument).

Your next Shift-Enter takes you back to the variable assignment instruction at A4, which Excel handles the same way it did earlier. So the next four steps produce

```

=SET.NAME("index",250)
TRUE
=IF(index>300,GOTO(A4),BEEP())
=IF(BEEP())

```

As you can see from the last item in this sequence, when the **logical test** argument of an IF function proves false, Excel's Single Step dialogue box displays the statement with just the **value if false** argument.

The rest of the Single Step display for this macro is straightforward. Our next Shift-Enter beeps the speaker and displays the result **TRUE**. Pressing Shift-Enter again takes us to the last instruction.

```
=RETURN()
```

which appears in roman. One more Shift-Enter displays the same instruction in italics and terminates the macro.

The incremental step feature was probably never intended for public consumption. In addition to producing some cryptic displays (like the compressed IF statements shown above), it disappoints by occasionally performing more than one calculation at a time.

For example, if you have two complex terms joined by an arithmetic or concatenation operator, the incremental stepper will first solve for the term on the left of the operator. Then, in its next step, it will solve both the right-hand term and execute the operator — in effect, carrying out two calculations at once.

Nevertheless, it provides more information than you'd obtain walking through a macro with the Step button. Try it out next time you're on the hunt for some particularly elusive bug — CS.

Your move

I've found the Basic **NAME . . . AS** command to be very useful. It moves only the directory entry, not the contents of a file. This is much faster, and it eliminates any full-disk errors or fragmentation that can occur with the traditional copy-then-delete technique of moving files.

The Basic program in Fig 5 is a simplified implementation of this feature. It lets you easily move a file about on a disk, either to a new directory, a new name or both.

This trick won't work between disks, and since the program doesn't accept wildcard characters, it is designed to rerun itself until no filename is entered.

W David

I usually use RENAME to change the names of files and a utility like MV.BAS to move them around. I don't like having to retype the file's name after the new path, so to avoid this I added line 65 to the listing in Fig 5. Now I can include only the new pathname for the new file, as long as I end it with a backslash. For example, if the old filename is APC.MAG and the new path is \LOVE\THAT\, the resulting file will be \LOVE\THAT\APC.MAG.

The NAME . . . AS command uses DOS

function 56h, introduced in DOS, version 2.0. When this function renames a file's full path, it effectively 'moves' the file into a new directory. Only the directory entry changes — the file data remains untouched. Starting with DOS 3.0, the same function can also rename a subdirectory, but the NAME . . . AS command doesn't allow this.

If your intention is to move a file to a new directory, using MV.BAS is a lot safer than copying and deleting it. Note that you can move to and from SUBST drives, too, as long as they're on the same physical disk. If U: and V: both represent directories on your C: drive, it's perfectly legitimate to move and rename a file from U:\FOO to V:\BAR — NR.

Real security

Some time ago you published an article on completely deleting sensitive files by using DEBUG to overwrite the file with nonsense. I've developed a file security system for the PC and I know that security — real security — is important for users.

There are two problems with the advice in the article. The first problem is less important: if you have a file larger than your free memory, you can't use this method. DEBUG isn't able to load the file into memory, so BX:CX will be zero and you'll end up with an error message.

The second problem is the real security problem. The procedure just doesn't operate perfectly. You can test it using a very simple method:

- Take an empty floppy disk;
- create two short files, first A.A and then B.B (the latter containing the so-called secure data);
- delete file A.A;
- try to overwrite file B.B with DEBUG, as the article indicates;
- look at the floppy and you'll see that the sectors belonging to file B.B have not been overwritten.

Of course these sectors cannot be retrieved with an unerase utility, but they can be analysed. On a hard disk the problem is the same, but it's just more difficult to find the sectors that belonged to the file.

The problem results from DOS's file handling. When you ask DEBUG to rewrite the file with nonsense, DOS finds that the file already exists, truncates it to zero length and frees all the clusters that were attached to the file. Then, when it writes the contents of the file to disk, DOS allocates clusters from the free clusters pool. These clusters won't necessarily be the ones that

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belonged to the file, so the sensitive data won't be overwritten.

Mr Éltető is quite correct in his thinking. The DEBUG process may work, but there's certainly no guarantee that it will. I tested the process before describing it in this column, but I performed the tests on blank floppy disks with no deleted files. On those diskettes it worked perfectly.

Note that if you attempt to overwrite a data file by **COPYing** another file over it, you'll get the same result. DOS first frees the clusters used by the old file, then allo-

cates a new set of clusters that may or may not include the old ones. Different DOS versions use different strategies for choosing what clusters to use, but chances are that you will not successfully overwrite the data.

To successfully overwrite a file's data, you need to use a program that opens the file for random read/write access and writes nonsense over the data without closing the file. In this way DOS never has occasion to free the file's clusters and allocate a new set. **KILLER.BAS**, a Basic program that is available on APC MAGNET, works in this fashion. I've checked the

exact sectors occupied by a number of files before and after using **KILLER.BAS** — **KILLER** works — **NR**.

Commenting macros in 1-2-3

Macro developers usually organise their work in a three-column format, with labels aligned in the first column, macro commands in the second and comments in the third. This is fine for many situations, but it becomes irritating when the commands are wide enough to push the comments off-screen. The problem is compounded when complex command entries require detailed comments!

Probably the most damning criticism of the method is that the comments are seldom read. Scrolling the screen left and right to read both code and comments can be a nuisance. The result? Users often disregard the comments and developers don't maintain them when upgrading the code.

Consequently, I prefer to embed comments in the macro code itself. In Lotus 1-2-3, I created a {COMMENT} procedure

```
Comment {DEFINE CommentText}
        {RETURN}
CommentText
```

This subroutine simply accepts a string parameter and returns to the main macro. It has no effect on the macro or its variables, because it does nothing.

To demonstrate the technique, I supplied the sample macro in Fig 6 — a portion of my personal accounting system. Note that you can include long commentary in a macro by placing several comments in sequence. The comments can also be included within command lines, like this:

```
{GOTO}AH1~
{L 2}{COMMENT Forces scrolling}
{R 2}{COMMENT "Same cell, new
display"}
```

This method is a lot easier to understand than the apparently illogical sequence

```
{GOTO}AH1~
{L 2}{R 2}
```

Note that if your comments include commas, semicolons or any other macro-language delimiters, you must be sure to enclose the entire comment in quote marks (as in the 'Same cell, new display' example shown above).

With this **COMMENT** procedure, I can ensure that the comments are read and increase the likelihood that they

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DIRDL.BAT

COMPLETE LISTING

```

@ECHO OFF
IF "%1"==" " GOTO NoParam
ECHO The following files will be deleted:
DIR/W %1
ECHO .
ECHO Press Ctrl-C to abort, or
PAUSE
ERASE %1
REM ***** NEW lines begin here *****
ECHO Deleted "%1" -- now checking results . . .
IF NOT EXIST %1 THEN GOTO noReadOnly
REM To create ^G in the next line, hold Ctrl and press G.
ECHO
ECHO At least one file matching "%1" was a Read-Only file
ECHO and hence was not deleted by the "DEL %1" command.
:noReadOnly
DIR %1 | find "bytes free" > XXXXXXXX.TMP
COPY XXXXXXXX.TMP YYYYYYYY.TMP > NUL
DEL XXXXXXXX.TMP
IF NOT EXIST YYYYYYYY.TMP GOTO end
DEL YYYYYYYY.TMP
REM To create ^G in the next line, hold Ctrl and press G.
ECHO
ECHO DIR showed you some files matching "%1" that DEL did not
ECHO delete. Press a key to see files matching "%1".
PAUSE > NUL
DIR /W %1
REM ***** NEW lines end here *****
GOTO End
:noParam
REM This is the message the internal DEL gives!
ECHO Invalid number of parameters
:End

```



Fig 7 This batch file handles a difference in the way DIR and DEL interpret the asterisk wildcard

will be updated when the macro is modified or enhanced. The method also guarantees that macro printouts will include the commentary. You may want to argue that repeated calls to a COMMENT procedure will slow down your macros. But I have found that the time penalty for doing this is negligible and that there is no obvious performance difference, especially if you use 286 or 386 hardware.

D Shinnners-Kennedy

Many macro writers will share Mr Shinners-Kennedy's dislike of the traditional three-column approach to commenting. However, not everyone will agree that the performance degradation caused by repeated calls to a do-nothing macro is negligible. To test the speed of this method, I added a {COMMENT} call to each line of a 10,000-line loop. On my 16MHz 386 machine (without coprocessor), the loop ran in 16 seconds without the comments and 51 seconds with them.

To speed things up, try this alternative to embed comments. Rather than a subroutine, you can use {IF} statements, as in

```

GOTO AH1~
{L 2}{IF 0}*** Forces scrolling
{R 2}{IF 0}*** Same cell, new
display

```

This method works because 1-2-3's macro processor ignores any statements to the right of an {IF} statement whose argument proves to be false. 0 is false by definition, so any text to the right of {IF 0} is ignored by 1-2-3's macro processor. You can put anything you like out there, with or without commas, semicolons, braces or even upside-down exclamation marks.

This method imposes a smaller overhead, because no subroutine calls are involved. Indeed, processing an {IF 0} statement on each pass through my 10,000-line test loop raised the execution time from 16 seconds to 32 seconds. The overhead, however, is still significant.

Although it increases performance, the {IF} approach is less flexible than Mr Shinners-Kennedy's {COMMENT} subroutine; {IF 0} doesn't let you place comments between two statements on the same line. The {IF 0} method is also more ersatz: a person looking at a macro full of comments for the first time might be bewildered by all that strange-looking IF logic. But if you're determined to mix comments in with your macro code, this is a leaner and meaner way to go — CS.

Playing your (wild) cards right

I have a quick comment on the delete/verify batch file that appeared in the June 1990 issue of APC. DOS parses the * wildcard character differently when it's used with the internal command DIR than with DEL or ERASE. Specifically, with DIR, a terminal asterisk fills out to the end of the entire filespec (that is, the entire 11-character name and extension), while the DEL command fills only to the end of the field (either name or extension). For example, DIR M* will display a file named MOUSE.COM, but DEL M* will not delete this file.

Accordingly, the batch file you printed may fail to show the deleted files correctly, although the error will be on the side of safety. That is, some files displayed may not be deleted, which is better than not displaying files that have been deleted. This difference is true of MS-DOS 4.01,

SAMPLE MACRO WITH COMMENT PROCEDURES

```

1      A      B
2      Comment {DEFINE CommentText}
3              {RETURN}
4      CommentText
5
6      \D      {COMMENT With CellPointer in Account Type column scan for}
7              {COMMENT DEPOSIT accounts only}
8              {GOTO}AH1~
9      Next    {DOWN}
10             {IF @CELLPOINTER("TYPE")="B"}{QUIT}{COMMENT Stop when blank}
11             {IF @CELLPOINTER("CONTENTS")<>"DEPOSIT"}{BRANCH Next}
12             {RIGHT}
13             {COMMENT CellPointer now in Amount column}
14             {COMMENT Ignore small accounts}
15             {IF @CELLPOINTER("CONTENTS")<500}{LEFT}{BRANCH Next}
16             {RIGHT}Processed{COMMENT Assume entry is processed somehow!}
17             {LEFT 2}{COMMENT Now in Account Type col. again}{BRANCH Next}

```



Fig 6 This sample macro illustrates a procedure, COMMENT, which embeds comments into the code without affecting the outcome of the macro. In long, complex macros, this method increases the likelihood that your comments will be read

and was also true of at least the latest version of the DOS 3.x series.

R Thompson

DIR is an oddball command in DOS versions all the way back to 2.0. DEL and most other commands interpret M* as M*. — files beginning with M and having no extension. DIR interprets it as M*. * — files beginning with M and having any extension. The FOR command and IF EXIST test both work like DEL.

DIR filespec indeed may list files that DEL filespec won't delete. This probably is better than deleting files that DIR doesn't list. But if you want to know when this happens, modify the DEL.BAT file as shown in Fig 7.

DIRDEL.BAT adds new lines after the ERASE %1 command. First the IF EXIST test is run on the original filespec. IF and ERASE interpret the filespec the same way, so if any files remain they must be Read-Only files. DIRDEL issues a warning and continues.

It's harder to test for files that DEL ignores. IF EXISTS won't work, so it takes three steps and two temporary files to determine if DIR %1 is finding any files. First pipe the output of DIR %1 through the FIND filter, looking for the string 'bytes free', and redirect the result to a temporary file. Next copy this temporary file to another temporary file. Finally, test whether the second temporary file exists. If it does, DIR found some files.

Why does this work? The DIR command displays a 'bytes free' message only when it finds one or more matching files. If the FIND command doesn't find any lines matching its input string, its output is a zero-byte file. DOS's internal COPY command won't copy a zero-byte file, so if the second temporary file exists, we know the first one wasn't a zero-byte file. Thus if the second temporary file exists, it implies the continued existence of one or more files matching the filespec.

This is a lot of baggage to add to the simple DEL.BAT. It might be simpler to write a program in Basic or Pascal to do the same thing. But it's comforting to know that if necessary we can do the job entirely in DOS's batch language — NR.

Interprocess communications

We have a new network application under development, but we want to avoid being tied to any specific LAN operating system. Should we test for IPX and NetBIOS and use appropriate drivers for whatever is present? Or do you think we should use Named Pipes instead?

B Dinsmore

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The real question here is: what is the best technique for passing messages between nodes on a network? Application programs use the NetBIOS interface, which is available in many LAN operating systems and Novell's IPX/SPX interface to send packets between nodes. Fax and SNA gateways, CD-ROM sharing programs and even electronic mail programs all address NetBIOS or IPX/SPX with requests for network transportation.

Some networked applications, such as Close-Up LAN, test for the presence of IPX or NetBIOS and load the appropriate driver software for the environment. If you develop in C or in assembler, this isn't difficult to do.

However, both Novell and Microsoft recently sang from the same sheet of music by declaring that Named Pipes is the best technique for interprocess communications, that is, for application programs to move data between different PCs on a network. Named Pipes is a high-level programming interface designed for interprocess communications. It's easy for programmers to use, and compatibility between implementations of Named Pipes and the programs that use it shouldn't be a problem. Novell and Microsoft now provide Named Pipes interfaces on both DOS and OS/2 client PCs.

In NetWare, for example, you load another piece of software called DOSNP.EXE along with the IPX.COM driver and NET3.COM NetWare redirector.

While Named Pipes seems destined to become a standard, it has one thing in common with a lot of other software that is trying to meet standards: it's slow. Our experiments demonstrate that we can move packets much faster by addressing IPX or NetBIOS than we can with Named Pipes, but in large part the speed of transmission depends on the size of the data blocks the application uses.

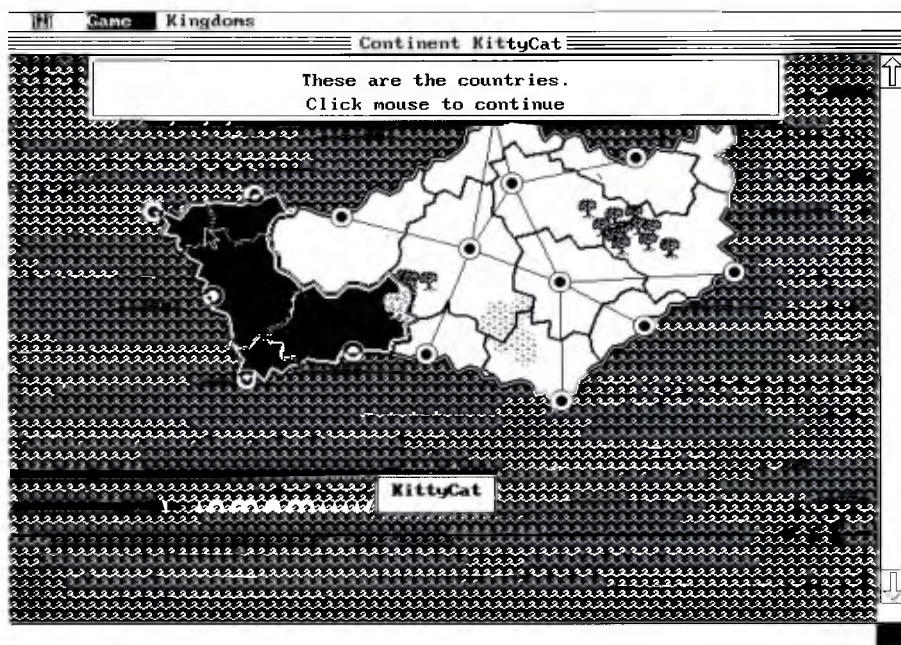
Named Pipes programs are capable of moving up to 64K of data in a single call. Programs using other transport mechanisms have to do a lot more work to move that much data. However, many applications will never need to move blocks of data as large as 64K.

For example, speed isn't important to programs like electronic mail packages, so they'll get adequate service from Named Pipes, regardless of how someone writes the programs. But if you're developing applications that use a lot of graphics or database records, you'd better use data retrieval techniques that deliver large blocks of data so that Named Pipes can move them efficiently. Otherwise, I'd consider using lower-level protocols to get the speed they provide, regardless of problems of potential incompatibility — FD.

END



Whether it be politics or fantasy, war is the outcome. This month, one gamester tastes what it would be like to control the world, and another attempts to save Lord British's world.



Should Victoria's VEDC and Tri-Continental have funded armament entrepreneurs or food firms? Should Australia form an economic union with New Zealand, or simply colonise? These are the sort of questions you are asked to answer in *The Global Dilemma: Guns and Butter*.

You are at the helm of a planned economy and your job is to rule the world. Each country is divided into provinces with different geographies, natural resources and populations.

World domination requires putting your population to work, producing a range of products from timber (no conservationists here!), coal and iron ore, through intermediate products like gun powder and harvesters to final products such as food and muskets. You balance the inputs to production (labour and materials) to obtain the best output mix. If you produce an excess of food, your population grows. If you produce weapons, you can put armies in the field.

The game is played by one human player and seven computer players. Like many strategy games, each turn is made up of phases. There are three phases — diplomacy, production and combat.

It is the introduction of diplomacy that adds spice to the game. Players are able to propose and join alliances against other players. These alliances involve temporary economic union, so that the alliance members benefit from economies of scale in their production, thereby boosting their strength and population.

The computer characters are a reasonable bunch to do business with — they bear grudges, exploit opportunities

The Global Dilemma: Guns and Butter

Computers: IBM PCs and compatibles

Distributor: Mindscape International

Telephone: (02) 899 2277

Price: \$79.95



and like to cut down tall poppies. In the diplomacy phase, the weakest player will propose a union against the strongest. Other players will join or propose other unions, with more or less success. You also have the chance to lead a union and set economic direction for the 20-year turn.

The game is about balancing the constraints on the growth of your empire. All provinces on the map are owned and it isn't in your interest to make too many enemies. If you become the largest country, other players will gather to cut you down to size. And since alliances are remade every turn, the view from your embassies can become ugly very quickly — economic sanctions bite fast.

Guns and Butter is another geopolitical simulation from designer Chris Crawford. An earlier work, *Balance of Power*, was about superpower rivalry. *Guns and Butter*, with its mythical countries and random maps, is more abstract in its geography. It is also far more detailed in its economics.

The PC game looks like a Macintosh port, and has a hearty appetite for RAM. You must have an uncluttered 640K session for the EGA/VGA version. For all this, the graphics are pretty ordinary: the main

working screens of the game are black and white, and the map is only functional. There are, however, many fine colour stills, especially in the Hypercard-style panels used for the production functions and the summary screens.

You'll need at least a 20MHz PC and EGA or VGA to play the game effectively. A mouse is highly recommended — it is possible to do everything with the rodent except to choose the name of your emperors and fulfil the manual-based copy protection requirement. Joysticks and music cards are not supported. While I didn't miss a joystick (it's not that kind of game), national anthems through the Sound Blaster would have been good.

The game has a weakness in saving — an important factor in four to six-hour games. Although not mentioned in the documentation, you can in fact save the current game when you quit (apparently one game for each continent game you have nominated) and you're offered a restore when you start. Also, you should choose your character's name wisely — the game uses your name in play and there seems to be no way of changing it.

As with *Balance of Power*, the documentation is obviously written by an enthusiast. Crawford gives an entertain-

ing background to his game and program design decisions. The only irritation is that the documentation is cursory on functional matters.

These flaws aside, *Guns and Butter* is easy to learn and use. At the beginner's level, you are on a continent with one (weaker) foreign country with no diplomacy and no terrain. In the second level, there is no diplomacy, but because you battle three other countries the economic and military choice are more complex. At the expert level, you play with the full catastrophe.

The diplomacy phase is easy to handle. The game provides feedback on who is who, how the players feel about each other, who is in which alliance and which people are likely to join with you.

If you join someone else's alliance, all the economic management is done for you, as the alliance leader runs his allies' economy for the turn. This is good relief for generals who don't want to be economic ministers. By the same token, if you lead an alliance, you run all your allies' economies as one.

Crawford has produced an effective and playable economic model for the game, managing to simplify the economics without losing its interest. The

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production function allows for labour and a tree of material inputs, which become increasingly complex as your production moves up the technological curve. For example, you start with farm tools and move up through iron ploughs to combine harvesters and irrigation systems. In a simplified but effective model, output responds to economies of scale — a union of 2000 people will produce more than twice as much as a country of 1000. Because of this, you need to maximise scale in all products.

Military operations are simply run, and work at a highly strategic level. There are

complexities in communications and deployment, which results in an interesting yet readily playable system. Unfortunately, though, the game lacks a two player or play-by-modem capability.

I was a little concerned about the game's depth of challenge. I was able to beat it on first play, and this occurred before I needed to produce any sophisticated products. While it wasn't too easy to beat first time around, there is a question mark as to the challenge of subsequent games.

The absence of civil unrest can encourage narrow strategies. If you choose

guns ahead of butter and build large armies, you can increase your population and resource base through invasion. As long as your diplomacy is sound, the game allows you to focus heavily on armaments, at the expense of your starving population.

Even with its handicaps — of flawed documentation, an uninspiring translation from Macland to the IBM and the fact that you might find it too easy to beat — *Guns and Butter* can cause truly obsessive behaviour. Like *Balance of Power*, it's an ambitious simulation — well worth a look.

Michael Aitken

O rigin Systems' *Ultima VI* almost single-handedly set the imaginative standards for the role-playing software back in 1980, and each subsequent game in the series has increased the size and detail of *Ultima's* fantasy world. The quests now require an investment of time and patience almost worthy of the search for the Holy Grail. *Ultima VI*, developed to mark Origin Systems's 10th anniversary, is easily the most complex yet.

This time, you and assorted friends must save the world of your ruler, Lord British, from an invasion of living, intelligent gargoyles. (You'd think that by now Lord British would have taken the hint and moved to some quieter neighbourhood. But no . . .)

A radical departure from the game's long-familiar visual style sets this *Ultima* well apart from its predecessors. True, Britannia feels the same, with cities like Skara Brae and old, familiar characters like Iolo and Lord British himself. You still visit dungeons, buy and sell weapons, and go on a number of lesser quests in preparation for The Big One. But the kingdom and its environs look completely different now. That might be because this is the first *Ultima* to be developed on a PC, instead of on an Apple. Rumour has it that when series creator Richard Garriott found himself with 640K worth of RAM to play with, he almost had mystical visions.

Terrain is rendered more realistically and less symbolically. City icons, for example, no longer expand to fill the screen. Instead, characters advance along roads and through woods until buildings stand revealed. Conversing with an *Ultima VI* character brings up an individualised portrait of your interlocutor, in a fashion similar to Origin's *Knights of Legend*. Human figures in distinctive clothing and monsters in assorted hides move through an attractive, varied landscape. The giant insects are real enough to send you hunting for bug



spray, and the hydras are probably as disgusting, pixel for pixel, as any horror film creature I've ever seen. Optional sound cards enhance matters with attractive music and effects.

This substantial overhaul and upgrade is the game's biggest drawing card, but also its chief drawback. All the animation and data (on seven 360K disks!) slows the pace as files load and run. *Ultima VI*, unlike its predecessors, moves glacially at times, even on a 286. With this much information to update, saving games in single data files is no longer possible — and that translates into only one playable game per software installation. A similar trade-off involves the bias towards higher resolution. EGA graphics are curiously blurred and dull at times, while the VGA/MCGA images come through with clarity, detail and beauty.

It's all part of the price paid for Origin's attempt to push a better wonderland through the front end of a computer terminal. In light of this, the program's major failing is all the more surprising.

Ultima VI

Computers: IBM PCs and compatibles, Tandy

Distributor: Dataflow

Telephone: (02) 331 6153

Price: \$84.95

AFTER DARK



The game is still unable (an inheritance from previous Ultimas) to recognise and respond to changing story conditions. There's a cute talking mouse in the game, for instance, who was killed when my team was ambushed. Lord British himself had taught her to speak and was very fond of the creature. When I brought her little furry body back to the monarch, all he did was chuckle and rave again about her accomplishments. Incongruities like this dissipate the 'alternate universe' atmosphere which Origin has spent so much time and effort building.

The user interface has been revamped as well, again with mixed results. For the first time, controls are mouse driven, and almost all familiar letter commands are gone. Changing weapons via keyboard (to name one typical activity) is no longer the simple '[R]eady [S]word'. Now, you have to choose Tab, position the icon over the weapon you want, and hit Enter. The accumulating tedium of this is partially offset by several time-saving keyboard shortcuts (unfortunately absent from the documentation or quick reference).

Combat remains elementary compared with many other role-playing games. Your choices are limited to Attack, Move, Switch weapons or Use item (including your book of spells). One new option changes any of your party (save your own character) into self-guided warriors during combat. While this works well in theory, the implementation isn't perfect. Time and again, several members of my group dropped out of the conflict entirely as they tried to advance towards the nearest foe. The enemy just happened to be behind an impenetrable 30-metre-long wall.

An A plus for effort on Ultima VI, then, and a mixed grade for achievement. People with VGA/MCGA graphics will want Ultima VI for its superb use of colour, and players of past Ultimas will want the game simply because it's Ultima. Just as fans of mystery novels devour every new book by a favourite author, Ultima addicts will jump at a fresh chance for swashbuckling adventures.

Barry Brenesal

END

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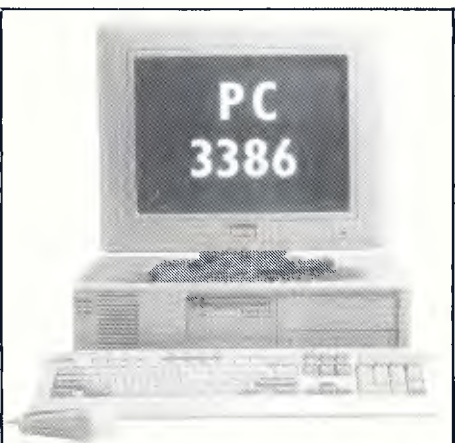
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Sharing and caring

Shareware: 'Try Before You Buy' Software

Author: Rob Rosenberger
Publisher: Paradise Publishing (distributed by Alphon Edugames)
Telephone: (07) 263 2744
ISBN: No ISBN number available
Price: \$5

Rob Rosenberger's 60-page book is an unashamed ad for the idea of shareware. Rosenberger defines shareware as commercial software that is sold on a test-drive basis — you try the program, and pay if you feel it's worth it. Other key classes of software are public domain software (distinguished by the fact that the author claims no copyright) and retail software (sold in shops, without the free trial and trust-based marketing of shareware).

Rosenberger is described in the book as a successful shareware author who is on the board of directors of the American Association of Shareware Professionals (a US-based body that seeks to maintain shareware industry standards and credibility).

The book pursues these interests by arguing the case for shareware. Rosenberger cites the late Andrew Fluegelman's PC-Talk (1982) and Jim Button's PC-File as foundation examples of shareware. He writes that shareware's development was encouraged by copy protection on retail software, and that shareware programs often offer better value for money (no marketing and distribution costs), earlier release (fast development outside corporate bureaucracies), niche products (while Microsoft probably won't release a 'bible-with-concordance' package for Windows 3.0, several are available in shareware catalogues), and open networks for innovation (free release of program source code).

Rosenberger does, however, acknowledge two downsides with shareware: documentation is almost always on disk, and some one-person operations write bad manuals.

A great part of the book is spent attacking common preconceptions about shareware. Rosenberger believes that shareware products and the BBS culture in which it thrives have been wrongly seen as breeding grounds for viral attacks. He includes an interesting analysis of the mainstream media coverage of the virus phenomenon, and takes delight in recounting incidents of viruses spread on read-only disks from reputable publishers.

Rosenberger acknowledges there's a good deal of mediocre shareware around. He also acknowledges that there are plenty of stars in the shareware stable, and points to industry awards and many commendations earned by shareware products (PC-File, 4DOS, the Swap Utilities and QubeCalc are among the programs mentioned).

Rosenberger's book is an engaging argument for shareware as a concept, and could be useful in defining standards for would-be shareware authors or publishers.

Michael Aitken

For those seeking cheap software, one of these books on shareware may have just the answer for you. And for the caring PC user, we take a look at a couple of books on virus protection and hacking.



Shareware: Good, Cheap Software

Author: Max Pinner
Publisher: BookWorks
Telephone: (09) 470 1080
ISBN: 1-875273-06-9
Price: \$9.95

While it may not cost much money to check out shareware products (virtually nothing if you download from bulletin boards), it can be time consuming to look for the gold in a pile of disks. Max Pinner's book addresses this problem. Aimed at

the novice user, it runs through a selection of readily available shareware products, which allows the prospective buyer to narrow the field, and gives the new user an idea of the range of products available.

Pinner's book is also the only one of the three books on shareware reviewed here to give Australian addresses for shareware distributors. While focused on the IBM PC, it is also the only book to cover a non-IBM machine (the Mac). The Amiga is snubbed (yet again) — a shame, since the Amiga-based Fred Fish catalogue program, with its program listings is a charming example of software publishing for the public good.

Like Rosenberger, Pinner is enthusiastic about shareware in principle, although he covers the history and issues in less depth. The reader has to take it on trust that Pinner is including the better shareware products and ignoring the worse ones.

Around 260 programs are mentioned in the book; around 30 of which are covered in depth. All major classes of software are represented in the book. The coverage of games, however, is grudging — Pinner considers 'games on an IBM clone computer to be a waste of time and certainly a poor use of an expensive piece of equipment'. Many would disagree...

Pinner's lists underline the great strength of shareware in allowing eccentric and niche products to be written and bought. A Minister's Database program will schedule people assisting at a Catholic mass. PC-Golf will analyse your performance with the sticks. There is software to teach languages, astronomy and all about ham radio. Shareware programmers have also excelled at producing small and specialised utility programs that help smarten up the DOS environment.

Around a third of Pinner's 150-page book is a lesson for novices on how to use a PC. It is a reasonably friendly text, and contains a few useful home truths for beginners. Pinner caters for the computer beginner, and offers to narrow the choices in the shareware catalogues. His Australian bias may be useful.

Michael Aitken

Finding (almost) Free Software

Author: Klaus Schlentner
Publisher: Abacus Press (distributed by Pactoronics)
Telephone: (02) 748 4700
ISBN: 1-55755-090-5
Price: \$29.95

Schlentner's *Finding (almost) Free Software* offers alternative documentation for a selection of prominent shareware and public domain programs. A side benefit of the book is that its table of contents would suggest mainstream shareware titles for shoppers.

In his introduction, Schlentner tells us not to expect public domain and shareware to be up to the standard of major retail products, and that shareware is about bargains for people who don't need 'professional' standard software.

Documentation on the programs is command based — there was little value added in terms of user tips or discussion of the strengths of products for particular purposes. The longest mini-manuals in the book are about 30 pages (PC-File,

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AsEasyAs). The less voluminous includes 20 pages each on PC-Write and The Draftsman. About 30 additional products are covered in Schlentner's 290 pages.

So why would you want Schlentner's book? Essentially, you would only buy it if you are curious about the command structure of a program you haven't yet seen, or if the documentation that came with one of your programs was written in triple dutch. (Bear in mind that almost all shareware programs come with documentation on disk, and that printed manuals are often given when you register.)

Schlentner's collection of alternative thumb-nail manuals might be of some use to those who want summaries of program documentation, or for people who like a program but can't use the manual provided.

Michael Aitken

The Computer Virus Protection Handbook

Author: Colin Haynes
Publisher: Sybex (distributed by The Law Book Company)
Telephone: (02) 887 0177
ISBN: 0-89588-696-0
Price: \$49.95

Viruses are of increasing concern to almost everyone involved with personal computers. Many individuals and organisations will have come into contact with a virus and should be taking preventative measures to limit the chances of it happening again. This book has been written as a guide to viruses, how they work and how they can be recognised, cured and avoided.

The text begins with a description of the mechanisms of a virus, how it infects a system and how it is activated. The procedures for healing an infected machine follow. Different techniques are used depending on the strain of virus, so many of the more infamous viruses are briefly described.

It is often said that prevention is better than cure, and this is especially true for viruses. Unfortunately, there are no sure-fire methods for avoiding viruses without crippling one's ability to use a computer, so a number of alternative methods are suggested.

This book comes with a diskette containing virus detection and simulation programs. The detection program is version 2.57 of the McAfee series. The simulation program will show the screen output of some viruses to help you recognise the symptoms, just in case it is not obvious. It is a nice change to see diskettes enclosed with the book rather than making the reader send away for them.

This book treats the general issue of viruses in a straightforward manner. The book is small (about 190 pages), and the author has covered the topic thoroughly without providing technical details on how the viruses work. This is a sensible approach as the magazines and newsletters put out by virus-busting organisations can deliver and update this information much more quickly than a conventional book publisher.

This book is worthwhile reading for anyone involved with developing procedures for virus protection. For technical details on specific strains it is best to refer to one of the many journals covering viruses. The diskette is a pleasant bonus, however it is not licensed for commercial use.

David Aitken

New Hackers Handbook

Author: Hugo Cornwall
Publisher: Random Century
Telephone: (02) 954 9966
ISBN: 0-7126-3454-1
Price: \$24.95

Hugo Cornwall has passed the reigns of the *Hackers Handbook* over to Steve Gold. It has been extensively revised and now appears in its fourth edition as the *New Hackers Handbook*.

The term hacking has many varied meanings, and in this book it is used to refer to the process of breaking into large computer systems by unorthodox methods. This type of activity is often illegal and potentially very destructive, so the book goes to great lengths to stress the hacker's code. The joy of hacking involves the matching of wits between the

system's designers and the humble hacker — booking free airline tickets to Brazil is not acceptable behaviour.

The book is just a guide for hackers; no trade secrets are enclosed. It provides a number of suggestions on how to approach a computer with the idea of breaking in. Some of the common techniques for accessing a system via the telephone network, attempting to login and breaking through to the operating system are explained.

Hacking requires an understanding of the communication methods used by the target installation, and to aid the prospective hacker a crash course in modem communications is included. The text then moves onto common hacking methods, including where to find a target, the use of switched networks and videotext systems.

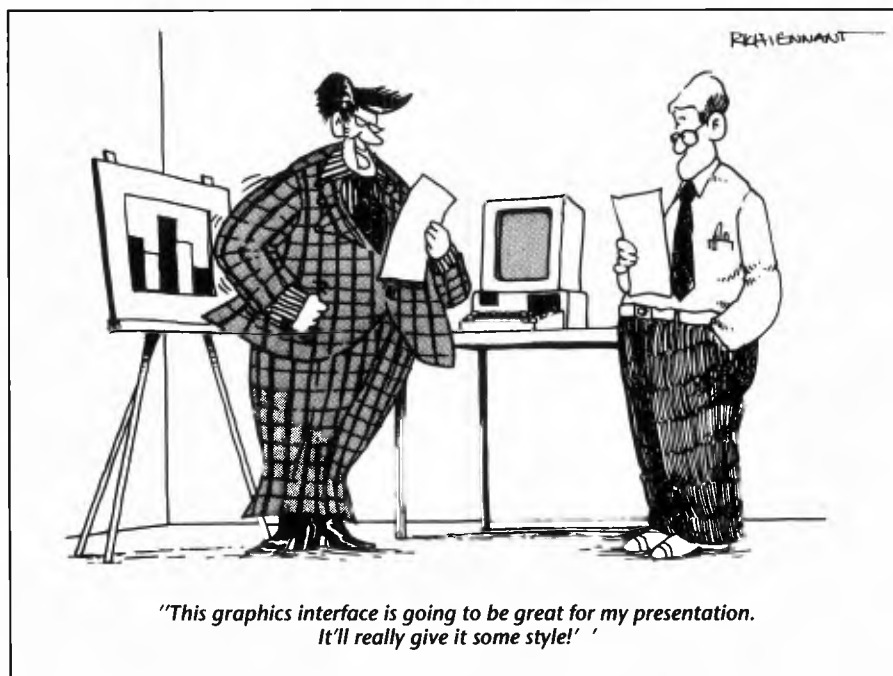
The authors are English hackers, so some of the information is only applicable within the UK. While the approach is common, specific information about public networks is not relevant in Australia.

The book can be used as a reference, although it is better to read it like a novel. There are many amusing anecdotes of famous hacks interspersed with the hard information. The presentation is slightly amateurish and all cross references refer to page 00 — someone presumably forgot to do a re-calculate on the word processing document. However, these are minor complaints.

Although aimed primarily at hackers, this book is suitable for anyone interested in telecommunications. It is an entertaining and informative guide to communications, and hacking in particular.

David Aitken

END





Online Real Estate

Kelvin Eldridge describes his approach to saving newsprint through technology.

There is a vast array of technology-based tools available to real estate agents for the promotion of properties. However, the tried and tested newspaper continues to thrive as the main promotional tool, probably because it is readily available and inexpensive for potential property purchasers.

Over the last few years, there has been a number of changes that will facilitate a challenge to the status quo. Changes both in the computer and the real estate markets.

Let's look at the computer market first. A recent advertisement in Melbourne's *Age* for the Australian Personal Computer show stated personal computer sales last year totalled 450,000 units. This means there is now a large base of users with access to a computer either at home, work, or at both.

The second component required to enable these standalone computers to access information in the outside world is a modem. The dial-up modem market is reportedly worth \$35 million dollars a year. With modems readily available for under \$300, we are now sitting on the edge of an exciting domestic communications era.

Finally, let's address the real estate market. Vendors must cover all advertising and promotional costs — which can range between \$500 and \$1500 — when selling a property. They should be looking for ways to reduce these costs and their susceptibility to further expenses. Remember, if a property does not sell, the vendor must still pay the advertising fees.

Online Real Estate now aims to improve this situation by providing a publicly-accessible database of property listings. Vendors will be able to list their property for a fraction of the current cost, and for the cost of a telephone call buyers will be able to easily find properties meeting their requirements.

The Online Real Estate system

The Online Real Estate system is a new concept in advertising real estate, enabling anyone with access to a suitably configured computer to view listings virtually any time of the day or night. By connecting into the system, potential buyers can quickly view listings that are relevant to them.

Listings are initially presented in a summary form in the sequence chosen by the buyer. Sequences available include suburb, dollar value, input date and key reference number.

A further filtering of the listings can be achieved to ensure that only properties meeting the buyer's criteria are displayed. Criteria available include dollar range, suburb, property type, building type, sale category, or any combination of these.

Based on the abbreviated description, the buyer can then view the entire listing. There is no charge for viewing listings, nor is there a membership or joining fee. Users only pay for the telephone call; all other costs are covered by the vendor.

Benefits

The Online Real Estate system has a number of obvious benefits, such as reducing the cost of advertising a property and providing a tool that helps buyers quickly find suitable properties.

Accessing the system

To use the Online Real Estate system you require a computer, a modem to connect

Format of listings

Entries in our listings contain the following information: system name, phone number, access, operator's name or alias, supported modem standards, network node number and hours of operation.

The access code may be P (Public), M (Members/registered users only), MV (as M, but with limited Visitor access).

The main modem standards are V21 (300bps), V22 (1200bps), V22bis (2400bps), V23 (1200/75bps) and V32 (9600bps). HST and Trailblazer are de facto high-speed standards, while Bell 103 and 212 are the US standards for 300 and 1200bps operation.

The three main BBS networks in Australia are FidoNet, GTnet and SIGnet. These networks provide a way of sending public or private messages between boards, whether they are in the same suburb or half a world apart.

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COMMUNICATIONS

to the telephone and a communications program that will allow your computer to act like a VT100 terminal. Set the parameters in the communications software as follows:

Telephone number: (03) 846 4411
Emulator: VT100
Baud rate: 2400
Word length: 8
Parity: None
Stop bits: 1

When you have connected into the system you will receive the message **Type 'public' and press enter:** [Note: 'public' is in lower case and is typed without the quotation marks.]

The system works on the familiar point-and-select menu system. Simply move the highlight on the top line using the cursor keys, and press enter when you are on the option you want. If you encounter any problems, simply quit your session and have your modem hang up the telephone.

If you have a 1200, 1200/75 or a 300 baud modem, on reconnection you will receive garbled characters. Send the BREAK instruction as defined by your terminal emulator a number of times until you receive a clean message, and proceed as usual. This shortcoming will be removed as equipment is upgraded.

Conclusion

Online Real Estate is a simple, grass roots system that has been designed to service the needs of the real estate market. It requires inexpensive and readily available equipment and is simple and fun to use.

System news

With thanks to Rodney Creer.

New systems

NSW

NorthWall BBS (02) 498 3785. MV. Jim McManus. V21, V22, V22bis, V23.

The Big Apple (02) 764 3410. MV. Patrick Perea. V22, V22bis. GTnet 302/021.

The Night Rider (02) 570 4242. M. Geoff Stanley. V22, V22bis. 11pm-6pm weekdays.

Albury Connection (060) 43 1301. MV. Rex Duncome. V21, V22, V22bis, V23. FidoNet 3:621/421.

Lake Macquarie BBS (049) 75 4120. M. Matthew Taylor. V21, V22, V22bis, V23, Bell 103, 212. SIGnet 28:2200/105.

The Widget Board (060) 41 1807. MV. Garry King. V21, V22, V22bis, V23. FidoNet 3:621/220.

Vic

Andromeda Connection (03) 398 4819. MV. Michael Sherman. V21, V22, V22bis. FidoNet 3:635/521. V21 accepted between 2am and 6pm only.
BBS 2000 (03) 894 3540. Frank Donato.

Bloodguard BBS (03) 315 2385. P. Mark Weselmann. V21, V22, V22bis. FidoNet 3:625/532.

Dark Crystal (03) 720 7724. P. Paul Sanders. V22, V22bis. FidoNet 3:636/503.

GW Central (03) 462 1707. MV. 'Backspace'. V22, V22bis.

Moonlight (03) 331 1220. VA. Tony Molina. V21, V22, V22bis, V23, V32. FidoNet 3:635/524.101.

Tempest (03) 850 9328. VA. Andrew Doran. V21, V22, V22bis, V23. FidoNet 3:633/209. 8am-4am and 6.15am-7.45am daily.

The Chalk Board (03) 437 0089. P. David Pizzey. V21, V22, V23.

The Software Parlour (03) 301 1877. P. Steven Lutrov. V21, V22, V22bis, V23. FidoNet 3:635/534.

Night Owl BBS (059) 85 4023. P. Ron Page. V22, V22bis. FidoNet 3:632/315.

Opus Wodonga (060) 24 7293. MV. Donald Anderson. V21, V22, V22bis, V23, V32, Bell 103, 212. FidoNet 3:621/221.

Qld

Bridge House East (07) 368 3758. P. John Bailey. V21, V22, V22bis, V23, Bell 103, 212. SIGnet 28:1100/369.

SuPaCom (07) 890 1844. MV. Paul Purcell. V22, V22bis, V23, Bell 212.

The Edge of Reality (07) 886 1886. MV. Rod Fewster. V21, V22, V22bis, V23, V32, Bell 103, 212. FidoNet 3:640/886.

White Lightning (07) 344 3621. P. 'Craig'. V21, V22, V22bis, V23.

SA

Mid-North BBS #1 (086) 33 0380. P. Lindsay Roberts. V21, V22, V22bis. FidoNet 3:680/834.

Mid-North BBS #2 (086) 33 0619. P. Geoff Roberts. V22, V22bis, Bell 103. FidoNet 3:680/833. 6pm-8am Tuesday-Sunday.

WA

Compulsive Computing (09) 419 1808. P. John Kerr. V21, V22, V22bis, V23. SIGnet 28:3100/8.

Tau Ceti (09) 341 2872. P. Stephen Darragh. V21, V22, V22bis, V23, V32. SIGnet 28:3100/3.

WEST-SIDE BBS (09) 344 3863. P.

'Sparky'. V22, V22bis. SIGnet 28:3100/11.
Pilbara BBS (091) 85 2854. MV. Mick Lazic. V21, V22, V22bis, V23.

Tas

Datamation (002) 65 2566. MV. Bob Purdon. V22, V22bis. SIGnet 28:5100/101.
Nick-A-File BBS (002) 65 2009. VA. Bob Gregory. V21, V22, V22bis, V23, V32. SIGnet 28:5100/1.
PointLess BBS (003) 91 2042. P. Andrew Bricknell. V32. FidoNet 3:670/305.

Updates

NSW

500cc Formula One BBS (02) 550 6858. M. Dean Mackin. V21, V22, V22bis, V23, V32, Bell 103, 212. FidoNet 3:712/218.
Amiga Connection BBS Club (02) 744 6010. MV. Mario Nicotra. V21, V22bis, V23, V32. FidoNet 3:712/744.
Assorted C BBS (02) 398 7935. MV. Michael Butler. V21, V22, V22bis, Bell 103, 212, Trailblazer. FidoNet 3:712/515.
Comet C-64 BBS (02) 567 7342. MV. Eric Davis. V21, V23. Requires UltraTerm or Palette on Commodore 64.
Compax Computers (02) 890 1059. MV. Alex Sardo. V21, V22, V22bis, V23. SIGnet 28:2300/106.
Down Under KBBS Permanently off-line.
EDI Network BBS (02) 772 3269. MV. Mark Kelly. V21, V22, V22bis. 3.30pm-7am weekdays, 24 hours weekends. Formerly The Dead Zone.
Inter City BBS (02) 319 0925. MV. Jodi Jackson. V21, V22, V22bis, V23, Bell 212. SIGnet 28:2100/100.
My Other Half (02) 660 8597. MV. Phil Young. V21, V22, V22bis, V23. FidoNet 3:712/517.
PC Users Group — Compaq BBS (02) 540 1842. M. Bruce Edney. V21, V22, V22bis, V23. FidoNet 3:712/505.
Quantum BBS (02) 588 2417. P. Limak Negrug. V22, V22bis, V32, Bell 212, HST.
Shadowland BBS (02) 416 6331. MV. Grant Bingham. V21, V22, V22bis, V23. FidoNet 3:712/707.7. Formerly The CyberSpace Nexus.
Sydney PC Users Group Ltd — IBM Board (02) 724 6813. M. John Clarke. V21, V22, V22bis, V23. FidoNet 3:712/505.2. Formerly PC Users Group — IBM Board
Tesseract BBS (02) 476 4313. MV. Warren Gerdes. V21, V22, V22bis, V23,

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Bell 212. FidoNet 3:712/513.666.
The Three Amigas (02) 609 4458. P. Bruce O'Connor. V21, V22, V22bis. FidoNet 3:713/615.
Beauford BBS Temporarily offline.
Computing Out West BBS (068) 62 5145. MV. Mark Livingstone. V21, V22, V22bis, V23, Trailblazer. FidoNet 3:620/250.
The Twilight Zone (065) 72 3970. MV. Matt Barton. V21, V22, V22bis, V23, V32. GTnet 302/022. 9pm-6am weekdays, 24 hours weekends.

Vic

Arcadia Opus (03) 867 8793. M. Andrew Newbury. V21, V22, V22bis, V23. FidoNet 3:634/385.
Club Amiga (03) 527 2835. P. Dror Howley. V21, V22, V22bis, V23. FidoNet 3:633/376.
Datastorm (03) 803 8239. VA. Richard Stocks. V21, V22, V22bis, V23. FidoNet 3:633/205.
Disintegration BBS (03) 725 2567. P. V21, V22, V22bis.
Eastern Plains BBS Permanently offline.
Eastwood Systems (03) 870 4623. MV. Mick Stock. V22, V22bis. FidoNet 3:632/300. 10am-midnight daily.

Submissions

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Andrew Judd. V22, V22bis, V23. FidoNet 3:636/501. Formerly AutoShop BBS.

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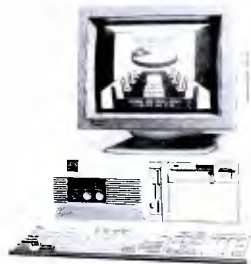
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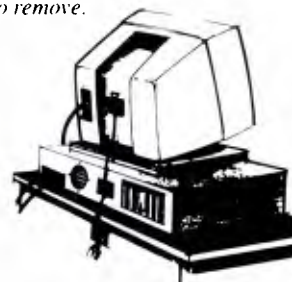
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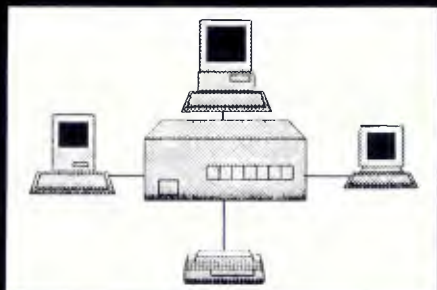
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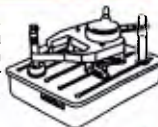
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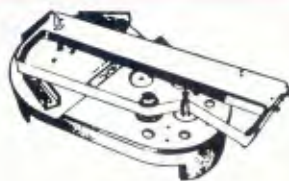
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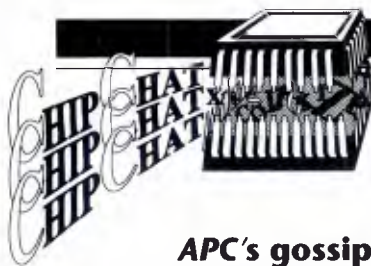
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APC's gossip hounds bring details of more sordid events in the computer industry.

Chip Chat's pledge this month is to say nothing about dead elephants, Kensington gore and marketing managers with funny names. It seems every paper in the land has already had a go at a certain advertising campaign.

♦ One ad that did not attract the same attention was in this august journal last month, hidden away among the classified



At last it seems someone has found a use for the Psion Organiser, the pocket computer that seems to have lost out badly to competition from Casio and Sharp. Datamaxx International is advertising something called the Datamaxx, a high-tech tool to beat the Treasurer at his own game. This \$499 piece of wizardry, with 'all the power of a desktop computer', (according to the blurb), runs some Aussie software called DataKeeper. It is designed to record expenses, with printed reports, and can also be used as a scheduler, clock, alarm and diary. The illustration shows it to be a Psion, which is a highly useful gadget, even if it lacks the user friendliness of its Japanese rivals. Maybe this application is just what the product needed.

ads. But staff at *PC Week* honoured it with centre spread. The spread featured a nearly naked lady, lying full length and gazing at a CD-ROM covering her private parts. The caption had a crude double entendre that might have amused a troglodyte.

The advertiser behind this shamelessly sexist piece of propaganda was Read Only Memory. The phone number is (02) 550 3938. Chip Chat hopes that all readers with autodial modems will set them to call that number repeatedly between the hours of nine and six.

♦ The ad might have been more appropriate for a new piece of software developed at La Trobe University. But don't get too turned on. Nudist is an acronym for Non-numerical, Unstructured Data Indexing, Searching and Theorising. In plain language, it helps an organisation keep tabs on masses of unstructured textual data.

The project is funded in part by the Victorian government and is about to be released for the Macintosh. Can you imagine the headline in the *National Enquirer*? Nudist in Government-funded text find!

♦ The Caxtno trophy for typo of the month award was easily won by the well-respected *Australian Financial Review*. A report from *The New York Times* was headlined 'IMB, Microsoft shake up industry.' There is an old saying in journalism — the bigger the type, the harder it is to spot the mistake. And IMB is a beauty.

♦ OK, here's one for all you hackers. Forget macho nicknames on your bulletin board chats. Real programmers are turning to pictures to sign their messages.

For instance, type in :-). Turned on his side, it looks like a smiling face! Replace the colon with a semi-colon, ;-) and you get a wink. Change the bracket, :- (, and you have a sad sign off. A few other characters come in useful too. Glasses can be shown by 8. A moustache might be { D a laugh, Q a cigarette in the mouth. A @

Down the line

Those following Intel's rise to the position of monopoly supplier of chips for high-end PCs will know that **Intel has sold out** of its allocation of 386 and 486 chips for the rest of the year and into 1991. What most people don't realise is that there are a number of **crucial bottlenecks** restricting the worldwide production of microprocessors. The latest to surface is a shortage in the capacity to apply an epitaxial layer onto the silicon slices used in chips. The equipment that does this is called an 'epi-reactor' and there are only a limited number of these reactors worldwide, all of which are running at 100 per cent capacity. A lot of this capacity is devoted to making CMOS chips for Japanese manufacturers.

Sick of waiting for a genuine 50MHz Intel 486 part? Then you need the latest and greatest Silicon Valley has to offer — the Velox ICECap. Put this over a 486 and it **deep freezes** the chip down to zero degrees Centigrade. Once frozen you can push the clock speed up to 50MHz without worrying about overheating. The guys out at Everex are reported to be having loads of fun with the new device. Only problem is it crashes every so often.

Looking for a faster way to make your **first million**? Try selling a screenplay to a Hollywood producer. Beware, however, that they only accept screenplays written to tight specifications. If you want to look as though you know what you're about try Scriptor from US-based Screenplay Systems ((818) 843 6557). Just write your masterpiece in a simple structure on any word processor, and Scriptor will compile it into a perfectly formatted script. At \$US295, it will pay for itself in the first scene of any screenplay you sell.

And while budding scriptwriters may be getting out of the computer business, yet another Japanese company is getting into making PCs. **Nippon Steel Corp** has announced its intention to manufacture laptops. According to a Japanese news report, 'The move comes as another step among Japanese steel makers toward diversifying their businesses, making Nippon Steel the first major Japanese steel maker to advance into the fast-growing, but highly competitive market'.

Are these guys for real? If so, look for a highly rugged model with a name like the **Ironbar 2000**. How about the Cast Iron Portable or the Bessemer 'B' Series? When are Japanese construction companies going to try their hands at making computers? How about Japanese bookmakers making PCs? They could release the **SP/2-to-1** range of business machines!

Chris Bowes

could be a turban, @= a nuclear explosion. Here are some complete characters.
8:-) a little girl
:-)-8 a big girl
!-) a Chinaman
:oe a sad clown
:-F a buck-toothed vampire with a missing tooth
\$-) how the sight of dead elephants affects an Amstrad marketing manager!

Get the idea? Chip Chat has a \$50 prize for the best character picture sent in. ♦Verbatim has come across a neat way to avoid the wounded bull charging of the average graphic artist.

When it wanted a new poster designed, it organised a competition for graphic design students. The poster is to celebrate Verbatim's 10th year in Australia and the prize is \$4000, a useful supplement to Austudy. Verbatim has also agreed to run the competition annually for the next five years.

The scholarship will generate as many ideas as there are entrants. It also generates some good PR. On both counts Verbatim is a winner. Full marks to that marketing manager!

END

Before You Buy a Personal Computer

Read about this amazing success story from the backyard of a Perth suburb!

Roly and Richard are two dedicated computer enthusiasts in their 30's.

From a private home in the Perth suburb of Kardinya they operate a 'backyard' consultancy with an absolutely outrageous name.

It's called -
"The Original Backyardie"
Definitely not the *razza-matazz*, high-tech name you'd expect.

Is it?
But it has certainly struck the right chord with computer buyers from individuals wanting a PC for home, through to large companies like Hamersley Iron and Jones Lang Wootton who operate extensive computer networks.

At the recent Perth Computer '90 show the guys sold over one hundred computers. How's that!

WHAT'S THEIR SECRET?
Roly and Richard are a couple of very personable, down-to-earth blokes that anyone from first time buyers to seasoned computer buffs can relate to.

They won't blow you away with "computer speak" even though they are enthusiasts themselves with 20 years of experience between them. Roly and Richard live and breathe computers. They know their product inside out and will match you with a system that exactly suits your needs.

You will also be nicely surprised by the competitive prices they offer - with virtually no overheads they are able to cut prices and still make a comfortable margin.

And their advice is FREE.



Left: Roly

Right: Richard

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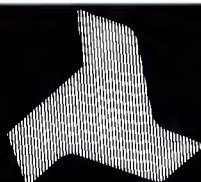
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